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FOREIGN SHRIMP FISHERIES

Other Than Central and South America

SPECIAL SCIENTIFIC REPORT–FISHERIES No. 254

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EXPLANATORY NOTE

The series embodies results of investigations, usually of restricted scope, intended to aid or direct management or utilization practices and as guides for administrative or legislative action. It is issued in limited quantities for official use of Federal, State or cooperating agencies and in processed form for economy and to avoid delay in publication.

United States Department of the Interior, Fred A. Seaton, Secretary

Fish and Wildlife Service, Arnie J. Suomela, Commissioner

FOREIGN SHRIMP FISHERIES

Other than Central and South America

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ABSTRACT

This report examines the shrimp fisheries of Canada, Greenland, the Caribbean area, Europe, North Africa, the Near East, Asia, Australia, and Oceania. The shrimp fisheries of Asia are the most important in terms of resources. While the catch there is very large, primitive fishing, processing, and distribution methods limit expansion of the industry. European production is largely absorbed at home. Other fisheries are small although some have growth possibilities.

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INTRODUCTION

The growth of the domestic shrimp industry since World War II and a growing interest in sources of supplies have created a demand for detailed information regarding the shrimp fisheries of foreign countries.

Special interest in information about the shrimp fisheries of Latin America led to the publication of Survey of the Shrimp Fisheries of Central and South America by Milton J. Lindner, now Regional Fisheries Officer of the American Embassy, Mexico City. That report (Special Scientific Report--Fisheries No. 235 - USDI -FWS) contains the results of on-the-spot surveys made by the author during his travels throughout Latin America. While important shrimp fisheries exist throughout the world, detailed information regarding those industries is in many instances fragmentary or unavailable.

This report has been compiled mainly from Foreign Service Despatches obtained by the United States Department of State and supplemented by Food and Agriculture Organization data and other sources. Despite the sketchiness of the information on some foreign fisheries, it is felt that the report can provide the reader with a basis for assessing their relative importance.

In some regions of the world, exploratory fishing has been so meager that little is known about potential production. Moreover, even where shrimp stocks are known to be abundant, such problems as inadequate shore facilities, excessive transportation costs, lack of skilled labor, restrictive controls, and shortage of venture capital militate against the establishment of commercial fisheries.

The largest foreign shrimp fisheries are in Asia. Here, millions of fishermen, using primitive methods for the most part, fish for shrimp and other species of fish and shellfish. The individual fisherman's daily catch is often poor by Western standards, although the aggregate catch may be very large. A modest start has been made in recent years to modernize shrimp fishing and processing methods in some Far Eastern countries, notably in Pakistan and India.

European waters support long-established and important shrimp fisheries. In general, the shrimp are small and catches are sufficient only for European markets.

Except for the Mediterranean area, no information has been assembled about shrimp fisheries for African countries. For most African nations, however, the shrimp fisheries are unimportant.

Ensuing sections contain information on individual countries in each of the principal areas of the world outside of Latin America.

Absence of information for a particular country indicates that no information or nothing beyond fragmentary data on imports and exports of shrimp could be obtained.

Many of the Foreign Service reports from which data were obtained do not specify whether the data refer to whole shrimp or heads-off shrimp. For this reason, care must be exercised in interpreting the landings data.

All United States import and export statistics (1957 data are preliminary) are from the Bureau of the Census, Department of Commerce, unless otherwise noted.

TABLE 1.-- SHRIMP CATCH IN SPECIFIED FOREIGN COUNTRIES, 1953 TO 1956

(In thousands of pounds)

Country	1953	1954	1955	1956
Canada	1,152	855	1,088	1,323
Cuba	1,941	1,051	1,719	(1)
Norway	8,296	10,937	12,198	13,448
Netherlands	36,579	31,506	42,677	36,155
West Germany	88,076	73,184	94,626	73,854
Spain	20,723	26,234	27,558	32,187
Pakistan	30,635	23,589	24,471	25,132
Thailand	30,423	23,810	35,053	33,730
Philippines	3,568	5,823	(1)	(1)
India	199,929	340,008	235,000	351,000
Japan	91,121	112,071	105,800	110,000
Korea	46,517	32,848	36,375	40,565
Australia 2/	3,348	4,257	6,648	6,173

1/ Data not available.

2/ Year ended June 30.

TABLE 2. -- IMPORTS OF SHRIMP INTO THE UNITED STATES BY COUNTRY OF ORIGIN, 1953 TO 1957

(In thousands of pounds)

Country	1953	1954	1955	1956	1957
Canada	182	58	101	146	243
Mexico	36,767	34,910	45,813	53,694	47,907
Costa Rica	46	43	141	421	227
Panama	3,943	3,660	4,224	5,846	8,379
Canal Zone	-	-	40	116	42
Cuba	123	113	71	222	608
Colombia	225	343	362	100	487
Surinam	-	-	3	37	65
Ecuador	-	547	1,604	2,950	3,867
Peru	351	447	385	250	626
Chile	-	-	1	84	45
Argentina	227	530	-	23	137
Iceland	240	27	50	91	64
Norway	489	153	221	168	132
Denmark	4	-	6	30	20
Netherlands	-	23	-	1	(1)
Spain	30	53	-	4	22
Turkey	7	30	10	6	3
India	44	112	125	1,012	1,252
Pakistan	-	-	4	229	472
Hong Kong	1	-	30	411	1,586
Japan	389	439	906	2,588	2,865
Australia	1	-	20	169	178
Others	31	31	51	20	505
Total	43,100	41,519	54,168	68,618	69,732

1/ Less than 500 pounds.

CANADA AND GREENLAND

In a strip of coastal waters along the northern part of the North American Continent, there are intermittent areas where shrimp stocks are adequate to support commercial fishing operations. The Canadian shrimp fishery, in British Columbia waters, is small in relation to the salmon, halibut, and other major fisheries in the same region. The shrimp catch is consumed in local markets. Other markets throughout Canada are supplied by imported shrimp, chiefly from the United States.

A small shrimp fishery is located in the Arctic waters of western Greenland and production is increasing.

CANADA

Shrimp are taken commercially only in the Province of British Columbia. The fishery in this Province has developed from about 119 thousand pounds in 1946 to more than a million pounds in 1955. Landings and landed value of shrimp in recent years have ranged as follows (from reports of the Canadian Department of Fisheries):

	Thousand pounds	Value
1946	119	$31,200
1947	107	27,500
1948	354	70,800
1949	355	58,500
1950	466	81,900
1951	545	112,100
1952	825	141,300
1953	1,152	144,000
1954	855	116,100
1955	1,088	181,000

The areas which lead in production are the lower mainland of British Columbia and Vancouver Island, where shrimp are taken in substantial quantity at all seasons. In Vancouver Island waters, the most productive season is from December to May. In the Gulf of Georgia and Howe Sound there is a steady yield of shrimp with a peak period in February and a low period in November.

Most of the craft used in the shrimp fishery are salmon gill net boats rigged seasonally for trawling. The boats catch shrimp during the winter and in early spring. When the salmon runs start, the boats are switched to salmon fishing. The gear used are beam trawls about 15 feet in width at the mouth. The drum in the stern of the salmon gillnetter serves as a winch to reel in the towline of the trawl. Fishing for shrimp is usually a 1-man operation.

British Columbia fishermen usually clean and boil the catch immediately after a drag. Thus, the shrimp arrive at the market at the end of the day practically ready for the table.

Five species of shrimp, all belonging to the family Pandalidae, are taken in the waters of British Columbia. They are Pandalus platyceros, P. borealis, P. hypsinotus, P. danae, and Pandalopsis dispar.

The number of vessels employed in the shrimp fishery is not known. In 1954, 80 shrimp trawl nets and 1,640 shrimp traps were employed in the fishery; these data provide an approximate indication of vessel activity.

Shrimp is processed in British Columbia principally as fresh and frozen meat. Some of the catch is sold heads-on in fresh and frozen form; only a small amount is canned. Much of the shrimp produced in British Columbia is sold in the domestic market, principally in Vancouver, Victoria, New Westminster, and other cities in the Province. The United States is the principal external market, but small quantities are exported to several other countries.

Four companies in British Columbia were primarily concerned with the marketing of shrimp in the Province. These firms handle shrimp as one phase of their fish-processing operations. Data on production of shrimp and shrimp products of these companies for the years 1952 to 1954 are as follows (as reported from Markets Branch, Department of Fisheries, Ottawa):

	Whole		Canned	Meats	Marketed value
	Fresh	Frozen			Canadian dollars
	Pounds	Pounds	Cases 1/	Pounds	
1952	42,000	13,000	-	172,000	$228,300
1953	192,500	14,200	198	220,800	360,800
1954	47,400	13,700	646	188,600	(2)

1/ 48 pounds in weight.

2/ Data not available.

Canadian import and export statistics combine shrimp with other shellfish. Statistics on United States shrimp imports from 1950 to 1957 show the following trade with Canada:

	Pounds	Value
1950	88,915	$59,856
1951	134,222	71,645
1952	182,977	116,142
1953	182,327	145,498
1954	58,192	53,760
1955	100,522	58,989
1956	145,636	118,610
1957	242,740	227,798

Canada in postwar years has been the principal export market for United States shrimp; exports to Canada have shown substantial gains in recent years as may be observed from the following table:

	Fresh or frozen		Canned		Dried	
	Pounds	Value	Pounds	Value	Pounds	Value
1950	519,021	$326,001	585,692	$454,613	30,340	$26,487
1951	592,477	354,942	1,013,663	735,355	43,174	36,371
1952	785,754	515,314	1,144,243	1,005,658	38,536	40,374
1953	854,709	707,885	1,326,869	1,378,630	52,494	64,290
1954	980,197	641,550	1,432,504	1,187,999	70,024	59,281
1955	1,432,590	888,025	2,121,664	1,874,535	56,776	38,872
1956	1,312,323	977,286	1,948,629	2,125,486	41,878	51,601
1957	1,567,094	1,248,779	1,670,924	1,739,091	22,085	13,839

The United States obtained tariff concessions from Canada in negotiations at Geneva, Switzerland, in 1956. Canadian import duties were reduced on fresh, frozen, and canned shrimp. On fresh or frozen shrimp, the duty was reduced from 12½ percent to 10 percent ad valorem. On canned shrimp, the duties were cut from 15 to 10 percent. Reductions were also negotiated in the duties on prepared and preserved, and peeled and deveined shrimp. In the former, the duty was lowered from 22½ percent to 10 percent, and in the latter from 17½ percent to 10 percent.

GREENLAND

Shrimp were first encountered in the offshore waters near Holsteinborg where a shrimp-canning plant was established. In 1949, the shrimp suddenly disappeared and the cannery ceased operations. The disappearance of the shrimp was attributed to the fact that the water temperature had dropped to below freezing.

In the summer of 1948, large shrimp grounds were found in Disco Bay off Christianshaab and Jakobshavn. Each was 10 nautical miles long and 5 miles wide with trawlable bottom. Shrimp were taken at a depth of 200 fathoms in water that was between 3 and 4 degrees above freezing.

In the 1950 season, 330,000 pounds of shrimp reportedly were caught, and 33,000 pounds of shrimp products were exported. During 1953, 310,000 cans of shrimp were packed in Christianshaab and about 13,200 pounds were frozen. The species is believed to be Pandalus borealis.

Five cutters fished from Christianshaab in 1954, where the most important shrimp plant is located. In 1957, about 1.4 million pounds of shrimp were landed in Greenland for canning. Eighty women work at the plant in three shifts during the season from June 1 to September 15. After the latter date, the water supply freezes and it is too cold to operate. Up to 8,000 cans of shrimp a day are packed in this plant. The best workers pick 110 to 132 pounds of shrimp per day.

In 1957, the United States imported 10,125 pounds of Greenland shrimp valued at $16,724.

CARIBBEAN AREA

While the Gulf of Mexico has been a bountiful source for shrimp, the contiguous waters of the Caribbean Sea, the Great Bahama Bank have so far been only of minor importance. Cuba is the most important producer in this area. Some shrimp are caught throughout the Greater Antilles and the Lesser Antilles, although the amount is small and, for the most part, is consumed locally. Occasionally, small shipments of frozen shrimp are made to the United States from the Bahamas.

CUBA

Shrimp fishing in Cuba has been limited until recently to the bays and shallow coastal waters of the country. The cast net has been the gear generally used. In 1953, a beam trawler was brought into the area for exploratory work in the Gulf of Batabano because of the belief that outer banks existed. During the exploratory operations, pink shrimp, Penaeus duorarum, were caught in one area, the bulk of which measured between 5-1/2 and 6-3/4 inches. A smaller species, Sicyonia typica, measuring 4 inches in length, and ten times more numerous, was also encountered.

Most of the exploratory fishing was conducted within a triangle formed by lines joining a point west of the Isle of Pines, off Siguanea Bay, the mouth of the Hatiguanico River, and the Batabano anchorage. This is an area of some 386 square miles. The bottom is muddy and contains a certain amount of mollusk shell but is free from vegetation. Depths of 2.5 and 3.5 fathoms are common.

A typical American shrimp boat brought into the area for exploratory fishing made catches of about 500 pounds of pink shrimp each night. Cuban fishermen have since become familiar with the operations, and new boats are being added to the fishery. In 1953, 11 shrimp boats were working the area, and others were under construction. By the end of May 1954 some 50 large shrimp boats were working the area, and at least 30 other small craft were reported engaged in shrimping in the Batabano Gulf. Fisheries also exist in other areas, and Cuban boats were reported fishing the Dry Tortugas area in 1955.

As a result of these recent developments, thousands of pounds of shrimp of good size enter the Cuban market each morning. The expansion of the shrimp fishery has strained the freezing and handling facilities in Cuba.

In 1955 an agency was established by the Cuban government to promote and regulate the fishing industry. This agency, the Instituto Nacional de la Pesca, has general authority to develop and expand the industry by various means such as educational programs, technical assistance, acquisition of modern equipment, administration of distribution centers, and other action designed to foster commercial fishing. The potential of the fish resources surrounding the island has been recognized as a means of substantially increasing the employment opportunities and generally strengthening the economy.

Under the terms of Cuba's basic fishing laws (Decrees 704 of March 28, 1936, and 973 of May 8, 1939) only Cubans may fish in Cuban waters for commercial or industrial purposes. Fishing vessels must have Cuban registry and flag and must be manned by Cuban citizens.

In official statistics, data on the catch of shrimp are not separately shown but are combined with fresh-water crayfish. Data compiled by the Banco de Fomento Agricola e Industrial de Cuba indicate that the landings of shrimp in Cuba during 1952 totaled 1,166,241 pounds valued at $373,197. Sales of shrimp and crayfish (principally shrimp) in the Havana market ranged as follows (as reported by the Bureau of Fisheries, Ministry of Agriculture, Havana):

	Pounds	Value
1950	1,027,000	$640,935
1951	763,500	342,800
1952	794,300	428,928
1953	1,941,000	810,700
1954	1,050,600	399,990
1955	1,718,800	552,250

Shrimp are also landed at Santa Clara and Orienta.

The commercial shrimp fishery in Cuba catches three species, Penaeus schmitti, P. duorarum, and P. aztecus, the first two of which make up the bulk of the catch. Two other species, Trachypeneus similis and Sicyonia typica, are also taken but are not commercially significant. Two of the Cuban species (P. duorarum and P. aztecus) are the same as those taken in the Gulf of Mexico and are caught on similar grounds.

Cuba was an important export market for United States shrimp. With the advent of the Cuban shrimp fishery, the market for United States shrimp in Cuba appears to have undergone a sharp decline. United States imports of shrimp from Cuba are as follows:

	Pounds	Value
1950	-	-
1951	-	-
1952	50	$32
1953	123,541	74,250
1954	112,950	48,692
1955	71,119	39,079
1956	221,946	119,054
1957	607,549	308,288

United States exports of shrimp to Cuba in the period 1950 to 1955 are as follows:

	Fresh and frozen		Dried		Canned	
	Pounds	Value	Pounds	Value	Pounds	Value
1950	21,000	$11,534	261,564	$165,584	17,179	$56,147
1951	27,092	11,884	316,233	178,328	102,646	76,904
1952	79,741	35,102	218,600	167,990	171,957	105,378
1953	3,175	2,042	70,800	73,117	67,016	55,268
1954	-	-	234,490	168,695	42,973	31,205
1955	2,250	2,250	79,230	60,843	32,218	21,275
1956	-	-	-	-	26,138	24,986
1957	800	610	2,900	3,202	29,075	28,678

DOMINICAN REPUBLIC

The amount of shrimp taken in the waters fished by the Dominican fishing fleet is small. In 1956, the catch including fresh water shrimp, amounted to about 30,000 pounds. The Government has one boat fishing along the coast and occasionally catches shrimp in Samana Bay, but there are no shrimp nursery grounds of any magnitude and no large areas for adult feeding in Dominican waters.

United States exports of canned shrimp to the Dominican Republic in 1957 amounted to 4,500 pounds valued at $4,340.

NETHERLANDS WEST INDIES (CURACAO)

The amount of shrimp caught along the coast of Curacao is very small. Production statistics are not available. There is seasonal shrimp seining in a lagoon at St. Martin, which is probably the only island in the Lesser Antilles where shrimp are of any commercial importance. The catch is consumed locally.

TRINIDAD

The total catch for the Island, consisting of Penaeus aztecus, P. schmitti, and Xiphopeneus kroyeri, is about 300,000 pounds a year.

In 1956, Penaeus aztecus and P. schmitti were on sale in the markets of Port of Spain for between 50 and 60 cents per pound.

Nine small skiff trawlers operate out of Port of Spain. They carry two men each and haul otter trawls 20 to 40 feet wide at the mouth. They are powered with 10-horsepower diesel engines.

Near Icacos, about 30 beach seines are operated. These seines are from 150 to 300 feet long and require up to six men for operation. It is in this fishery that most of the Xiphopeneus are taken.

EUROPE

Nearly all European countries with a sea coast have long-established shrimp fisheries and traditional markets for shrimp products. Western Germany, Holland, Spain, and Norway are the leading producers. Western Germany and Holland, in addition to shrimp used for human food, catch large quantities of very small shrimp which are processed into poultry feed.

There is some trade among European countries in shrimp products processed from shrimp landed by the continental fishing fleets, but in general the catch is consumed at home. Small shipments of processed shrimp speciality items are made to the United States.

BELGIUM

The Belgian shrimp fishery has declined in recent years, both in number of vessels and in size of catch. The decline is attributed to high operating costs of the boats, which are 10 to 30 years old, and to a lack of capital to replace and rehabilitate the fleet.

Under a law which became effective on August 23, 1948, the Belgian Government may provide assistance to the fishing industry. According to this law, the reimbursement of a loan advanced by an authorized bank may be guaranteed by the Government. The same guaranty may be extended for the purchase in Belgium or abroad of new fishing boats or for the installation of new motors. In addition, the Government may pay up to 50 percent of the interest due on loans.

The shrimp caught is the gray shrimp, Crangon crangon. The commercial sizes vary from 260 to 360 whole shrimp to the pound; the shrimp measure from 1.8 to 3.3 inches from the tip of the rostrum to the telson.

The shrimp fishing areas are some 8 to 10 miles off the Belgian coast and in the open sea off the Netherlands coast. Shrimp fishing is carried on throughout the year. The catch is larger from April to October, when some 67 percent of the annual catch is taken. The principal ports of landing are Zeebrugge and Ostend, which together account for 87 percent of the total catch; the rest is landed at Nieuport and Blankenberghe.

Shrimp catches during the years 1952-55 ranged as follows (from reports of the United States Foreign Service Despatches):

	Thousand pounds	Value 1/
1952	5,737	$1,043,130
1953	4,316	1,039,910
1954	3,331	847,920
1955	4,140	950,430

1/ Converted to United States dollar equivalent at official rate of 50 Belgian francs equal $1.

At the end of 1954, the shrimp-fishing fleet comprised some 151 coastal motor cutters of an average gross tonnage of 10 to 35 tons. In 1949, the fleet consisted of 187 vessels totaling 3,046 gross tons. It has declined each year since then.

Each vessel operates with a crew of from 2 to 4 men. The gear used for shrimp fishing consists of floating trawl nets having an average length of approximately 39 feet and a mesh which measures about 0.9 inch when stretched.

The catch is boiled in salt water on the boats as soon as caught and is marketed in that form. Only negligible quantities are canned, frozen, or processed into fish meal. Practically all shrimp are retailed unpeeled at the equivalent of about 55 cents (United States currency) a pound. Some are peeled by the retailers and are sold at approximately $1.80 a pound.

Only a small part of the catch is exported - 5 or 6 percent on the average. The principal destination is France, but some shrimp go to the Belgian Congo and Western Germany.

The United States enjoyed a considerable export trade in canned shrimp with Belgium. In the prewar period 1934-38, about 280,000 pounds annually were exported. In 1957, exports of canned shrimp to Belgium totaled only 41,502 pounds, valued at $45,407. Annual export statistics for the period since 1950 are as follows:

	Pounds	Value
1950	92,085	$53,108
1951	41,963	26,779
1952	36,555	21,023
1953	28,120	27,897
1954	36,420	30,118
1955	38,144	31,824
1956	24,540	25,084
1957	41,502	45,407

The Belgian import duty on canned shrimp is 20 percent ad valorem. In addition to this, there is a 10 percent "sales tax" applied to the cost price plus the ad valorem duty.

Belgium imports more than a million pounds of peeled and unpeeled shrimp annually, almost all from the Netherlands.

NETHERLANDS

In 1956, shrimp landings in the Netherlands amounted to 36.9 million pounds. Of the total catch, 23.8 million pounds were of small immature shrimp used for fish meal for poultry feed. Production of shrimp for the years 1951 to 1956 ranged as follows (as reported in the FAO Yearbook of Fishery Statistics and United States Foreign Service Despatches):

	Immature or small	Common or mature
	Thousand pounds	Thousand pounds
1951	18,739	10,141
1952	19,841	8,818
1953	26,676	9,903
1954	21,605	9,901
1955	28,880	13,797
1956	23,827	13,080

The production of the larger mature shrimp averaged about 9 million pounds in the years prior to 1955. Shrimp exported ranged from 270 to 320 to the pound; shrimp consumed domestically, from 360 to 410 per pound.

The shrimp are cooked aboard the fishing craft immediately after being caught. Shrimp destined for export are generally cooked in heavily salted water, while those destined for domestic consumption are only slightly salted.

The fishing fleet consists of very small cutters of about 26 feet in length and a tonnage of about 9 tons. About 350 vessels engage in the shrimp fishery. The gear used is the otter trawl or the beam trawl, depending upon the nature of the sea bottom. In the Ems Estuary, shrimpers also use a special shrimp net called the hose net, an elongated tubelike net used in the tidal currents and fixed to stakes.

The principal shrimp fishing areas are the Ems Estuary, the coasts of the Provinces of North and South Holland, the estuaries around the Province of Zeeland, and the Waddenzee. The best catches are made from March to June and from August through November. Netherlands boats frequently land their catches in Belgium.

Shrimp fishing is limited through the licensing of vessels, and there appears little prospect for expansion of the fishery. The shrimp fisherman pays a levy to a fund from which payments are made to fishermen for shrimp which do not reach a minimum price fixed by the Marketing Board for Fisheries Products. This agency is a semiofficial body representing all sectors of the industry. The Board's agents control the size

and quality of landed shrimp. Peeled shrimp are inspected by the Commodities Inspection Service. The Marketing Board also issues licenses to the fishermen, and may indicate the ports at which shrimp must be landed. It may fix the quantities and varieties to be landed. The minimum length of shrimp for export has been set by the Board at $2\frac{1}{2}$ inches and that for domestic consumption at $2\frac{1}{4}$ to $2\frac{1}{2}$ inches.

Little canning and freezing of shrimp is done in the Netherlands. The processing of small shrimp into meal is carried out by fish-meal plants in the Provinces of Friesland, Groningen, and North and South Holland.

Exports of shrimp from the Netherlands during 1955 totaled 4,469,000 pounds compared with 3,342,000 pounds in 1954. Almost 95 percent of the exports, as a rule, go to Belgium and France, in about equal proportions. The preference of the French trade is for unpeeled shrimp and that of the Belgian trade for peeled shrimp. Western Germany and Great Britain are other markets for Netherlands shrimp.

United States imports of shrimp from the Netherlands are as follows:

	Pounds	Value
1951	-	-
1952	3,027	$3,601
1953	6,842	4,976
1954	22,955	14,413
1955	-	-
1956	1,001	1,159
1957	263	372

The United States also has a small export trade in shrimp with the Netherlands. Export statistics for recent years are as follows:

	Fresh or frozen		Canned		Dried, salted, etc.	
	Pounds	Value	Pounds	Value	Pounds	Value
1951	-	-	2,610	$2,294	-	-
1952	-	-	23,295	11,585	-	-
1953	-	-	3,225	1,995	-	-
1954	-	-	4,987	4,030	3,954	$4,538
1955	9,250	$6,240	8,731	6,536	3,525	3,214
1956	7,363	7,711	8,563	8,537	-	-
1957	12,191	14,933	540	1,222	-	-

FRANCE

Landings of shrimp in France in recent years have ranged approximately as follows (from reports of the United States Foreign Service Despatches):

	Shrimp	Prawns (large shrimp)
	Thousand pounds	Thousand pounds
1952	3,885	831
1953	4,261	631
1954	4,409	661
1955	4,506	754

The species landed are the common shrimp, Crangon crangon, and the prawn, Palaemon serratus.

The principal shrimp fishing ports are Dunkirk, Boulogne, Honfleur, Caen, St. Nazaire, Le Croisic, La Truballe, Marenne, and Ile d'Oleron. Shrimp are caught during the entire year, but the catch is usually greater during the period from May to October. The fleet is estimated to comprise 400 trawlers which engage seasonally in other fisheries. No canning or freezing of shrimp is done by the industry, and most of the catch is marketed fresh.

Exports of shrimp from France are relatively insignificant, in 1954 amounting to 1 ton of common shrimp and 16 tons of prawns. The exports were destined primarily for Great Britain and Switzerland. Imports of fresh shrimp into France, principally from the Netherlands, have totaled as follows in recent years as reported in the FAO Yearbook of Fishery Statistics in 1951-53 and from French Customs Statistics for 1954 and 1955:

	Thousand pounds
1951	4,140
1952	2,127
1953	2,041
1954	2,875
1955	5,541

United States exports of shrimp to France in recent years were as follows:

	Fresh and frozen		Canned	
	Pounds	Value	Pounds	Value
1951	-	-	1,050	$1,560
1952	-	-	1,200	1,539
1953	-	-	1,038	1,985
1954	-	-	1,287	2,522
1955	1,200	$2,480	1,360	2,480
1956	6,570	3,760	375	595
1957	938	1,134	2,250	3,410

WESTERN GERMANY

While the bulk of the catch is processed into poultry feed, Western Germany is actually one of the largest producers of shrimp in the world. In 1955, the catch totaled 94.6 million pounds. The country accounts for more than 50 percent of all shrimp produced in Western Europe. Shrimp constitutes about 5 percent of the total Western German fishery catch.

The following summary shows the Western German shrimp catch and utilization for the three years 1953-55 (from the Corporation for the Promotion of Coastal Fisheries, Central Marketing Agency):

	Catch	Utilization	
		Poultry feed	Human consumption
	Thousand pounds	Thousand pounds	Thousand pounds
1953	88,076	78,609	9,467
1954	73,184	63,358	9,826
1955	94,626	82,190	12,436

The principal species caught is Crangon crangon, but the catch includes red, brown, and sand shrimp. Shrimp of the type used for poultry feed number about 1,000 to 1,400 shrimp to the pound. The shrimp used for human consumption number about 200 to 250 shrimp to the pound. The male shrimp, largely used in shrimp meal, grows to an average length of about 2 inches. The female shrimp reaches a length of about 3 inches. The shrimp season normally starts late in March and extends through December with the peak runs occurring from mid-July through October.

Shrimp are caught in a 15-mile coastal zone along the North Sea coast and in the estuaries of the Elbe, Weser and Ems Rivers in water 6 to 45 feet deep. A total of 674 vessels and 1,800 fishermen using small trawl nets are engaged in the fishery. A small amount of shrimp is taken with stationary gear. Fishing outside the coastal areas has not been economical because the shrimp are too widely scattered. The principal ports of the shrimp fleet are Husum, Toenning, Buesum, Friedrichskoog, Cuxhaven, Dorum, Neuharlingersiel, Norddeich, and Greetsiel.

More than 70 percent of the vessels of the Western German shrimp fleet are 30 to 40 feet long. The balance are small motor launches and larger type cutters of about 50 feet. The vessels over 30 feet are powered by diesel motors of 40 to 75 horsepower. The size of the cutters is limited by the shallow waters along the coasts. The medium-sized cutter has been found more economical in operation. Two trawl nets are fished simultaneously, one carried on each side of the vessel by beams extended from the mast of the ship.

The net used is a beam trawl made up of a steel tube about 24 to 28 feet long which forms the upper part of the opening. At the ends of the tube, triangles made of flat steel are attached to form the sides of the net. Sledge runners are attached to the bases of the triangles to facilitate the movement of the net on the sea bottom. The lower part of the net is formed by a ground rope with small wooden rollers. The upper part of the opening extends over the ground rope so as to catch shrimp stirred up from the sea floor. The net is about 45 feet long.

Since the end of World War II, the governments of both the Federal Republic and the coastal states have helped the fishermen to improve the productive capacity of their vessels by granting loans at low rates of interest. Marshall Plan counterpart funds were also used to build larger and faster boats, and to renew and improve fishing gear.

It is believed that it will be possible to increase the output of edible shrimp so that the whole fishing operation for feed and edible shrimp will be more profitable. Edible shrimp represents about 12 percent of the total catch.

In 1955 about 87 percent of the catch, or 82.2 million pounds, was dried and used as a protein supplement in poultry feed. The remaining 13 percent, or about 12.4 million pounds, was used for human consumption. About 1.8 million pounds of this quantity were sold unpeeled to domestic consumers and 485 thousand pounds were exported mainly to France and England. The balance of about 10.1 million pounds was peeled, yielding about 3½ million pounds of shrimp meats. Of this quantity, approximately 110 thousand pounds were exported in cans of which about 10 to 15 thousand pounds were sent to the United States. An increasing volume of shrimp meat is being exported to England. The export of heavily salted unpeeled shrimp to France has also been increasing.

The catch of shrimp is sorted aboard the boat largely by hand screens, although mechanical screens are coming into use. Shrimp for human consumption is cooked in boilers aboard the vessel. The cooked shrimp is cooled and packed in baskets for shipment to the processing plants.

Feed shrimp is landed unprocessed and delivered to the drying plants, of which 36 are operated by processing firms and 50 by fishermen.

The unpeeled shrimp are steamed and subsequently dried on wire screens by a stream of forced hot air. The yield is about 25 percent of the wet shrimp. The end product may be stored for more than a year without deterioration.

Cooked edible shrimp are peeled by hand in the ports. One worker can peel an average of about six pounds of shrimp per hour. About 6,000 persons are employed in peeling. The economic feasibility of installing United States shrimp-peeling machines is currently being investigated. The yield of shrimp meat from peeled shrimp fluctuates between 30 to 35 percent. The product is preserved with boric acid and packed in cans of 1.6 to 14.3 pounds and in barrels of 120 pounds. The barrels are sold to the restaurant and delicatessen trade. Shrimp preserved in this manner will keep up to 6 months. About 15 percent of the peeled edible shrimp is packed, after having gone through the boric-acid treatment, in small family-size cans weighing from one-fifth to three-fourths of a pound and is sterilized in a pressure cooker. These shrimp will keep up to 1 year. There are at present 36 shrimp canners in Western Germany. The majority of these firms also engage in drying operations.

A central marketing organization representing fishermen, drying plants, wholesale dealers, and poultry-feed producers, is established by law to coordinate supply and demand for dried shrimp used for poultry feed. The law also requires a 2-percent admixture of dried shrimp in a specific type of protein-enriched poultry feed. This largely ensures an outlet for the greater part of the product of the shrimp fisheries. The fixed prices at which the shrimp are marketed are controlled by the governments of the two coastal states in which the fisheries are located. Production is scheduled on a quota basis, and producers are required to deliver to the marketing organization, which acts as the intermediary between producers and buyers. Other functions of the organization are the promotion of consumption and the conduct of market research and scientific studies financed through contributions paid by fishermen on the basis of tonnage landed.

Poultry feed made with the admixture of dried shrimp is not exported. On the contrary, dried shrimp is imported, chiefly from the Netherlands, as a supplement to domestic supplies when they are insufficient to meet demand. Import quotas are administered by the Western German government upon application by the marketing organization. Western German imports of dried shrimp in recent years have totaled as follows (reported from the United States Foreign Service Despatches):

	Thousand pounds
1953	5,710
1954	1,640
1955 (Jan.-Nov.)	1,955

United States imports of shrimp from Western Germany from 1950 to 1957 have ranged as follows:

	Pounds	Value
1950	825	$750
1951	-	-
1952	-	-
1953	7,706	4,359
1954	3,796	2,126
1955	7,789	5,369
1956	420	262
1957	6,631	4,463

A small quantity of canned shrimp is exported from the United States to Western Germany. American shrimp are considered a specialty item in Western German food markets. Statistics of exports to Germany are as follows:

	Pounds	Value
1950	-	-
1951	-	-
1952	-	-
1953	10,277	$10,968
1954	840	532
1955	5,000	5,600
1956	750	992
1957	5,150	5,958

NORWAY

Shrimp fishing extends the length of the Norwegian coast from the Skagerrak in the south to Varanger Fjord in the north. The species taken is a deep-water shrimp, Pandalus borealis. This shrimp is usually found in deep fjords and in submerged channels off the coast where the sea bottom is soft and clayey.

Commercial fishing for shrimp is carried on in waters from 50 to 200 fathoms deep. There are no seasonal limitations and fishing goes on throughout the year. The boats used in shrimp fishing are from 30 to 50 feet long. The smaller boats operate in the more protected fjords while the larger boats are used on the open sea. Shrimp trawl nets of 78 to 96 feet in size are used.

Shrimp fishing reportedly began in Oslo Fjord in 1898. In recent years catches of shrimp have increased considerably, particularly in northern Norway; several productive grounds have also been opened on the southern coast. Large stocks have been found in Sorlandet, the Skagerrak, on the West coast, and in northern Norway off Svalbard.

Total production in the last 5 years has ranged as follows (as reported from the Norwegian Ministry of Fisheries):

	Thousand pounds
1951	5,952
1952	6,834
1953	8,296
1954	10,937
1955	12,198

The shrimp taken commercially range from 100 to 160 shrimp to the pound, varying from 3.5 to 4.7 inches in length. The smaller shrimp ordinarily are used for canning. Most of the Norwegian shrimp are exported iced or frozen in the shell, although in the last few years there has been a growing market for frozen peeled shrimp in cartons or plastic containers. A relatively small percentage of the catch is canned. The United Kingdom and Sweden are the chief markets for iced or frozen shrimp

taking about 96 percent of that pack. None of these shrimp have been exported to the United States. Exports of iced and frozen shrimp from Norway from 1953 to 1955 are shown below:

	Thousand pounds
1953	3,333
1954	3,494
1955	3,957

Statistics on exports of canned shrimp are not shown separately in Norwegian export statistics. United States imports of shrimp from Norway, presumably all canned, have totaled as follows since 1951:

	Pounds	Value
1951	88,408	$65,886
1952	256,536	177,818
1953	489,405	303,006
1954	153,212	103,977
1955	221,156	153,274
1956	168,090	130,314
1957	132,361	106,457

DENMARK

Danish production of shrimp averages about 2 million pounds annually. The bulk of the catch is of the species Pandalus borealis. The shrimp fishing season runs from April to September; June is the best month. The greater part of the catch is canned.

The pack of canned shrimp totaled 613,000 pounds in 1953 and 326,000 pounds in 1954. In 1956, the United States imported 29,675 pounds of shrimp valued at $33,311 and 20,229 pounds valued at $29,992 in 1957.

SWEDEN

Shrimp are caught off the Province of Göteborg. In 1954, 2,420,000 pounds of shrimp, Pandalus borealis, were caught, valued to the fisherman at about $1,000,000. The small shrimp Palaemon squilla are caught in very limited quantities, though exact information on this catch is not available. Fishing is done by trawling.

Landings in recent years were as follows (reported from the United States Foreign Service Despatches):

	Thousand pounds
1951	1,540
1952	2,640
1953	2,860
1954	2,420

United States imports of shrimp from Sweden have ranged as follows in recent years:

	Pounds	Value
1951	1,102	$388
1952	2,459	1,957
1953	4,878	5,174
1954	4,416	5,302
1955	1,693	2,066
1956	1,500	1,863
1957	8,356	10,599

Exports of canned shrimp from the United States to Sweden increased greatly in 1955, and some frozen shrimp was exported in that year. Exports to Sweden are shown below:

	Canned		Fresh and frozen	
	Pounds	Value	Pounds	Value
1951	-	-	-	-
1952	8,250	$10,540	-	-
1953	-	-	-	-
1954	6,800	5,900	-	-
1955	98,943	87,619	4,125	$2,427
1956	74,377	68,430	1,471	2,007
1957	54,039	61,561	1,803	2,563

ICELAND

The production of frozen shrimp in 1955 totaled 44,000 pounds. The Icelandic Fisheries Association has estimated the annual production of canned shrimp to range between 20,000 to 44,000 pounds, most of which is consumed locally. Export data on shrimp are not available since shrimp is combined with other items in the official foreign-trade statistics.

The Icelandic shrimp is smaller in size than the shrimp caught off the American coast. The species is believed to be Pandalus borealis.

Shrimp are exported to the United States, the United Kingdom, and Denmark. United States imports of shrimp from Iceland have ranged as follows:

	Pounds	Value
1951	40	$15
1952	18,611	22,895
1953	(1)	(1)
1954	27,303	26,980
1955	49,842	51,413
1956	90,840	96,993
1957	63,558	68,379

1/ Data for 1953 omitted because of an obvious overstatement in the Census figures.

GREAT BRITAIN

Shrimp landings in Great Britain have been fairly constant in recent years, averaging around 4 million pounds of common shrimp and 15,000 pounds of prawns. In 1954, the landings of brown and pink shrimp in England and Wales totaled 4,039,000 pounds, valued to the fishermen at $450,000. Landings of prawns totaled 17,000 pounds, valued at $11,396.

The only area in Scottish waters where appreciable quantities of shrimp are caught in Wigtown Bay, an inlet of the Irish Sea. Average annual landings here are about 224,000 pounds, valued at $31,000. Supplies here are "potted" 1/ and sold in England and Scotland.

In recent years the landings of shrimp in England and Wales have totaled as follows (as reported in the Foreign Service Despatches):

	Shrimp	Prawns
	Pounds	Pounds
1952	3,789,500	16,700
1953	4,170,200	12,300
1954	4,038,900	16,600

The species of shrimp and prawns taken include the brown shrimp, Crangon crangon, the pink shrimp, Pandalus montagui, and the prawn, Palaemon serratus. The brown shrimp attains a total length of 2 to 3 inches, the pink shrimp averages only 2 inches in length, and prawns reach 4 inches.

Prawns are found only on the south and west coasts of England and Wales. Eighty percent of the landings of brown and pink shrimp are made in three areas: The Wash, an inlet of the North Sea; the Thames Estuary; and Morecambe Bay, an inlet of the Irish Sea. Smaller fisheries exist in North Wales, the Solway Firth, Liverpool Bay, and off the Norfolk and Suffolk coasts.

The pink shrimp is fished from mid-April to the end of September in the Thames Estuary and in Morecambe Bay, and up to the beginning of January in the Wash. The fishing grounds in the Thames are in depths of 2 to 10 fathoms, and in the Wash from 6 to 18 fathoms. The brown shrimp is fished in water up to 6 fathoms and taken throughout the year.

1/ "Potted" shrimp are shrimp quick-frozen in butter, spiced, and usually put up in a half-pint or pint paper container.

The principal method of fishing is with beam trawls varying from 18 to 24 feet in width. These are usually operated from diesel-powered craft from 25 to 50 feet in length. The shank net is also used. It is a rigid-footed dredge net about 12 feet in width adaptable for towing either by boat or horse and cart. Hose nets, which are fixed to stakes, are used on a small scale in estuarine channels, being tended and reset with each tide. Push nets are used in shallow waters and sandy beaches. These are small manually operated dredge nets.

Prawns are fished in rocky areas near the shore by means of pots and hoop nets. The season for prawns is from May to December. During the winter the brown shrimp and prawn move offshore to some extent. The pink shrimp enter inshore waters in late spring and disperse into deeper water during the winter.

Fishermen engaged in the shrimp industry at one time could benefit from the Inshore Fishing Industry Act in the form of loans and grants for the purchase of boats and engines. This aid is no longer available to the shrimp fisheries. However, there is a duty on imported shrimp and licensing requirements.

According to the Fisheries Ministry, the shrimp industry in Great Britain could be expanded by improved marketing procedures. The introduction of a standardized system of grading and sorting, a better system of collection of catches, installation of cold storage at ports, and the use of shrimp-peeling machines are some of the means to this end. Landings might be increased by improved methods of fishing.

Shrimp are potted for sale largely to the British market, but some attempt has been made to export potted shrimp. Some are also quick frozen in 1-pound or smaller packages.

Shrimp exports are not shown separately in British customs reports. United States imports of shrimp from Great Britain are shown in the following summary:

	Pounds	Value
1951	557	$101
1952	918	707
1953	468	681
1954	-	-
1955	865	1,002
1956	2,850	1,091
1957	-	-

Great Britain was, in prewar years, the principal export market for United States canned shrimp. Prior to World War II (1934-38), United States exports to that country averaged 2,441,000 pounds of canned shrimp annually. Frozen-shrimp exports averaged 46,000 pounds annually. In recent years, exports have been as follows:

	Canned		Frozen or fresh	
	Pounds	Value	Pounds	Value
1951	-	-	-	-
1952	-	-	2,778	$2,390
1953	-	-	4,238	4,218
1954	300	$622	9,249	7,505
1955	7,830	5,890	10,480	8,185
1956	2,850	2,745	1,350	945
1957	-	-	-	-

PORTUGAL

The production of shrimp in Portugal has shown a decline in recent years as shown in the following statistics (reported in United States Foreign Service Despatches):

	Pounds
1950	125,700
1951	105,800
1952	86,000
1953	81,600
1954	68,300

The species caught in waters off Portugal is Crangon crangon. The prospects for an increase in production are not favorable, according to official and trade sources. Nearly all of the catch is consumed domestically. Small exports of shrimp, totaling 6,000 pounds, were reported in 1953.

SPAIN

Shrimp production in Spain has remained relatively constant in recent years. In 1954, production was somewhat higher than in prior years and totaled about 26 million pounds. Catch statistics by species for the years 1952-54 are shown below (as reported in the United States Foreign Service Despatches):

Species	1952	1953	1954
	(In thousands of pounds)		
Gamba (Crangon crangon, Penaeus membranaceus, Salenocera membranacea)	20,386	17,947	23,963
Carabinero (Aristeomorpha foliacea)	1,871	2,138	1,920
Quisquilla (Palaemon squilla, Palaemon xiphias, Crago)	465	638	351
Total	22,722	20,723	26,234

The fishing area for both the gamba and the crabinero is the southwestern coast of Spain between the south of Portugal and the Strait of Gibraltar, the port of Huelva being the center of this area. About 80 percent of the total Spanish catch of gamba and of carabinero is obtained there. The fishing area for quisquilla extends along the eastern coast and is centered at the ports of Barcelona and Valencia where about 70 percent of the catch is taken. Practically all the rest of the catch is obtained on the northwestern shores.

The main fishing seasons are from February through June for the gamba, June through August for the carabinero, and October through February for the quisquilla.

The vessels engaged in shrimp fishing also operate in other fisheries. They use trawl nets at depths from 600 to 1,000 feet.

The sizes of the shrimp are about as follows: gamba, 40 to the pound; quisquilla, 140; and carabinero, 18.

Practically the entire Spanish catch, generally marketed whole or boiled, is consumed in the domestic market. None of the catch is canned.

Shrimp exports are not segregated in official statistics. United States imports of shrimp from Spain have totaled as follows in recent years:

	Pounds	Value
1951	-	-
1952	-	-
1953	29,946	$3,617
1954	53,089	10,737
1955	-	-
1956	4,000	2,880
1957	21,800	4,444

ITALY

Data on shrimp production in Italy are not available, but it is believed that Italian production and consumption of shrimp is very small. The local population consumes in the fresh form virtually all the shrimp taken in domestic waters. The demand for processed shrimp comes from the tourist trade and is met by imports. Italian foreign trade statistics do not show shrimp separately.

United States exports of canned shrimp to Italy are shown below:

	Pounds	Value
1951	2,625	$2,965
1952	4,110	4,262
1953	-	-
1954	4,165	3,068
1955	2,580	2,582
1956	2,940	3,661
1957	1,560	2,510

United States imports of shrimp from Italy are reported as follows:

	Pounds	Value
1951	-	-
1952	-	-
1953	-	-
1954	2,943	$3,345
1955	99	59
1956	-	-
1957	59,531	35,515

NORTH AFRICA AND THE NEAR EAST

Shrimp are found along most of the southern shores of the Mediterranean and as far south on the Atlantic side of the Continent of Africa as the Canary Islands. Morocco, Egypt, Algeria, and Tunisia all have some shrimp production. However, the catch is small in relation to total fish catch. In Morocco, for example, the catch is only incidental to the extensive fishing operations for sardines.

Shrimp fishing is carried on along the shores of the eastern Mediterranean and northward to the contiguous waters of the Aegean Sea. Israeli vessels fish in adjacent coastal waters while the Turks have a small fleet based on the Gulf of Iskenderun.

EGYPT

Trade sources estimate that shrimp production in Egypt is approximately 6.6 million pounds annually. With appropriate vessels and equipment, it is believed, the catch could be increased to over 30 million pounds annually.

Shrimp are found along the entire coastline of Egypt. The principal areas are near Rosetta and Damietta where the shore is quite sandy. An equally productive area reportedly exists in the Suez (Red Sea) area but there is practically no production in that area owing to its distance from the large cities and the absence of refrigeration and canning facilities.

Three types of shrimp are found in Egyptian waters, gray shrimp running 16 to 30 to the pound, pink shrimp running 21 to 50 to the pound, and brown shrimp running 15 to 25 to the pound. One of the species caught apparently is Penaeus kerathurus.

Shrimping is carried on during the entire year but only as a sideline with other fishing operations. The best season appears to be from November through March.

Only one plant in Egypt freezes shrimp. This is located in Alexandria and has a capacity for handling 4 metric tons of frozen cooked shrimp daily.

During 1955 one firm exported 500 tons of shrimp from Egypt to France. A few trial shipments were made to the United States in 1954. Census Bureau statistics indicate that 39,951 pounds of shrimp valued at $19,872 were imported from Egypt in 1957. France obtained chiefly frozen whole cooked shrimp in 2- and 5-pound cartons. Small quantities of shelled frozen shrimp were also exported.

MOROCCO

The landings of shrimp in Morocco in 1954 totaled 13½ million pounds. Shrimp belonging to the Penaeidea are found both along the Atlantic and Mediterranean coasts in quantity.

United States exports of shrimp to Morocco have been as follows:

	Frozen		Canned	
	Pounds	Value	Pounds	Value
1951	-	-	-	-
1952	-	-	-	-
1953	-	-	2,980	$4,340
1954	8,090	$5,552	-	-
1955	3,000	1,293	150	130
1956	4,575	3,854	-	-
1957	3,000	3,300	-	-

TUNISIA

In Tunisian official statistics, shrimp and prawns are included with lobsters. In 1955, Tunisian production of these crustaceans amounted to approximately 175,000 pounds. In the same year about 94,000 pounds of shrimp and prawns were exported, all but a very small fraction being shipped to France.

ALGERIA

Algerian shrimp production in 1956 was in the neighborhood of $3\frac{1}{2}$ million pounds.

The species predominant in the catch is a very small gray shrimp which runs from about 190 to 220 to the pound. About 80 percent of the Algerian shrimp catch is taken off the coast of the Departments of Algiers and Oran.

The equipment of the shrimp fishing industry is generally considered old and obsolete.

Algerian shrimp are exported to France. The size of these exports cannot be determined because shrimp is combined with other crustaceans in the official statistics. Algerian shrimp are at some disadvantage in the French market because of high transportation costs.

Total production in the period 1951 to 1956 has been as follows (as reported in Foreign Service Despatches):

	Thousand pounds
1951	4,378
1952	3,968
1953	3,900
1954	3,089
1955	3,239
1956	3,446

TURKEY

Shrimp production in Turkey is estimated by trade and government sources to total from 65,000 to 100,000 pounds annually. Shrimp are landed principally at Iskenderun and also at Izmir and Istanbul. The main producing seasons are the spring and autumn months. The shrimp range in size from 15 to 50 to the pound.

At Iskenderun, on the Mediterranean, the shrimping fleet consists of 12 trawl boats (of 25 to 30 tons' capacity) that catch shrimp as well as other species. Two freezing plants and a small shrimp cannery are located there.

Shrimp are sold domestically and exported to the United States. The local prices are higher than the prices that can be obtained in the United States. Exports of shrimp, therefore, are supported by a subsidy which is established to make Turkish prices competitive with United States prices since the currently prevailing dollar famine in Turkey makes it desirable to export shrimp to the United States. Data on Turkish shrimp exports are not available.

United States imports of shrimp from Turkey in recent years have ranged as follows:

	Pounds	Value
1951	-	-
1952	-	-
1953	6,724	$2,654
1954	30,226	10,968
1955	10,100	3,668
1956	6,485	3,650
1957	2,752	760

ISRAEL

Shrimp reportedly are available in Israeli coastal waters in much greater quantities than is reflected by the current catch. In 1956, it was anticipated that production would reach a record total of 220,000 pounds.

Shrimp freezing on a commercial basis has been initiated in Israel, and a pilot plant is currently in operation, according to a report from the International Cooperation Administration.

Since shrimp and other shellfish are not eaten by the local Jewish population because of religious dietary laws, the demand in the local market is not great. Israel, however, is attempting to develop the production of shrimp for the export market. It is believed that all but one-fifth of the country's production can be made available for export.

The species of shrimp reported taken in Israel run 12 to 35 to the pound, and range in color from white to bright pink for the shallow-water species, and from light brown to red for the deep-water shrimp. Shallow-water species are: Penaeus kerathurus, P. semisulcatus, and P. japonicus; deep-water species are: Aristeus antennatus and Aristeomorpha foliacea.

ASIA

About half of the world's catch of shrimp comes from the tropical and semitropical waters of Asia. For the most part, the fishing methods and gear used are primitive and the consumer market is often restricted by transportation and distribution problems to the area within walking distance of the local fishing village. Processing is limited mainly to drying or salt-curing. With enormous quantities of shrimp available in shallow coastal waters and particularly in the great delta areas with their brackish water, lagoons, tributaries, and estuaries, the aggregate catch of millions of fishermen, equipped with only dugout canoes and primitive gear, is very large. Fresh-water shrimp are also caught in considerable quantities throughout Asia in rice paddies, lakes, and canals.

THE CHINA MAINLAND

Shrimp are abundant along most of the coastal waters of the mainland of China. The species Penaeus carinatus is especially abundant on the north side of the Shantung Peninsula and in the Yellow Sea. Penaeus carinatus, Penaepis monoceros, and Penaeus japonicus are the principal species caught off the coast at Hong Kong.

Shrimp production seems to have been around 200 million pounds annually, although no reliable figures are available. In any event, about 80,000 fishermen on junks fished mainly for shrimp and other shellfish. From Hong Kong alone, 600 junks operated shrimp beam trawls. Moreover, a larger number of small craft fishing in shallow estuarine waters or inshore areas contributed substantial quantities of shrimp to local markets.

Probably 90 percent of all of the marine fishery products are consumed by the great masses of population in the relatively narrow coastal belt because of limited distribution facilities. Drying and salting are about the only methods of preserving fish. Shrimp in the dried form or preserved as a sauce has a somewhat wider distribution geographically than most fishery products, being considered a luxury.

For a long time China has been on an import basis for dried shrimp and other shrimp specialty products. The early shrimp fisheries in California and Louisiana, for example, grew under the stimulus of exporting dried shrimp to the Chinese market.

INDIA

Shrimp fishing in India has existed for centuries but has become commercially important only during the last decade. Primarily, this is a result of expansion of export markets, the entrance of foreign capital into the industry, and the encouragement and assistance given to the industry by the Central and State Governments of India and by the United Nations, the Colombo Plan, and the Indo-American Technical Cooperation Agreement. Despite this attention, the shrimp fisheries of India yield only a small fraction of what they could produce if the resource were exploited in a fashion comparable to the scale it is exploited in Europe, North America, and Japan.

Available data on shrimp production indicate that the Indian shrimp catch is second only to, if not greater than that of the United States. Official statistical information on the shrimp catch is not available. Estimates reported by Indian Fisheries Authorities at the Sixth Session of the Indo-Pacific Fisheries Council place the catch of shrimp for the years 1950-54 at an average of about 185 million pounds annually. The 1954 and 1955 catch estimates were as high as 300 million pounds each or double the estimated average annual catch for the period 1950-53. The bulk of India's shrimp production consists of young and immature shrimp caught in estuaries and in tidal waters. Shrimp fishing in India, for the most part, is primitive in nature. Modern methods of fishing and mechanized equipment, to a modest extent, have only been employed since the entrance of foreign interests into the industry in recent years. There has been very little deep-sea (40 fathoms and over) trawling off the Indian coasts. At present there are no craft equipped for deep-sea fishing in the country, although the opportunities for developing a fishery of this sort are excellent.

Shrimp fishing is concentrated in the coastal areas of Bombay, Malabar, and Andhra. The catch of shrimp by principal areas is shown below (as reported by Indian Fisheries Authorities at the Sixth Session of the Indo-Pacific Fisheries Council, FAO - United Nations, Tokyo, September 30, 1955):

Area	1950	1951	1952	1953	1954	5-year Average
	(In thousands of pounds)					
Bombay area 1/	128,930	128,253	136,674	171,472	315,056	176,077
Malabar area 2/	18,574	24,647	19,958	5,842	14,668	16,738
Andhra area 3/	15,064	10,394	8,808	11,980	5,805	10,410
All other areas	2,507	6,014	4,319	10,636	4,478	5,591
Total	165,075	169,308	169,759	199,930	340,007	208,816

1/ Ratnagiri to Broach.
2/ Mangalore to Cape Comorin.
3/ Madras to Visakhapatnam.

Note: Data on the catch of shrimp are based on sample surveys conducted by the Central Marine Fisheries Research Station.

Fresh-water shrimp landings in India are estimated at about 18 million pounds annually. The species of shrimp most important from a commercial standpoint are Penaeus carinatus, P. indicus, Metapenaeus monoceros, M. affinis, M. dobsoni, M. brevicornis, and Parapeneopsis stylifera.

Penaeus carinatus is the largest in size, often reaching a length of 10 or 12 inches, and is brightly colored. It is not often caught in large numbers. The species caught from estuaries and backwaters are much the same as those caught in marine fishing, with the exception of Parapeneopis stylifera, which is primarily a marine shrimp. The fresh-water shrimp are largely species of Macrobiachium which predominate in the coastal lakes during the rainy season when the water is fresh or nearly fresh. Penaeid shrimp increase in numbers during the following months when the salinity rises; in the late summer months the catch consists entirely of Penaeidea.

Penaeid shrimp apparently migrate into estuaries and backwaters quite early in life in the postlarval phase. They live for some months in this environment and then go back to the sea, where further growth and the attainment of sexual maturity takes place. The seaward migration may be a passive process, as the shrimp are carried into the sea during the monsoon period by the flow of rainwater.

Ocean-caught shrimp run principally 20 to 30 shrimp to the pound. The backwater and fresh-water shrimp are smaller in size. Giant shrimp, 5 to the pound, are also caught seasonally in a restricted area and in limited amounts.

Fishing seasons

Although a few shrimp are caught throughout the year, shrimp fishing is largely seasonal. On the west coast, the season coincides generally with the monsoon period, June to September. On the southwestern coast of India, few fishermen go after shrimp from October to April, as they find it more profitable to fish for sardines and mackerel. In the Bombay area August to September is reported to be the best period, while in Saurashtra shrimp fishing is concentrated in the period from July to December.

On the east coast, the shrimp-fishing season starts after the start of the northeast monsoon in December and may last until April. The Collier Lake area features shrimp fishing from May to December. In the backwaters of Travancore-Cochin, shrimp fishing extends throughout the year.

The shrimp-fishing seasons in India are determined by such factors as monsoons, floods, and the natural movement of the shrimp. In the Bombay area, following the onset of the monsoon, the salinity and temperature of coastal waters fall to low levels. This induces the shrimp to migrate to the coast from deeper waters. The peak in shrimp production in India is in the months of April and May, as the following monthly catch data for 1954 indicate (based on samplings by the Central Government of India presented to the FAO):

Month	Thousand pounds	Month	Thousand pounds
January	10,013	July	6,478
February	13,198	August	6,205
March	14,903	September	2,047
April	82,882	October	54,318
May	104,292	November	29,698
June	1,133	December	14,840
		Total	340,007

Shallow-water trawling and seining

The crude boats generally used for inshore operations are regarded as inadequate, and several improvements have been suggested. Some success has been obtained by using "pablo" boats (designed by FAO naval architects) with 10-horsepower engines which have operated on an experimental basis in south coast waters under the supervision of an FAO fishery engineer from Iceland. Boats provided under the terms of the Indo-American Technical Assistance Program have been used in waters as deep as 20 fathoms. The boat seine is the commonest type of net used in commercial fishing in the sea along both the southwest and southeast coasts. The net usually has a baglike section and two wings which project forward. Two dugout canoes or catamarans are used in its operation.

Tidewater fishing

In the Gulf of Kutch, a small canoelike sailing boat is used for shrimp fishing. This boat is of less than 2 tons' displacement, flat bottomed, 18 to 22 feet long, and 3 to 4 feet wide. The boat is suitable for fishing during low tide, when it may be hauled in very shallow water. The net commonly used for shrimp fishing in this area is a small funnel-like bag about 14 feet long and 3 feet deep. The nets are distended and kept in position in shallow water by tying them to two poles 8 to 12 feet long stuck in the bottom of a creek or other tidewater opening. The mouth of the net is kept open by ropes, and the entire structure is fixed in position at the time of the incoming tide. The shrimp collected in the tail of the net are emptied into the fisherman's boat.

Another type of net used in the estuaries and backwaters is a conical net, with floats and weights to anchor it, or it may be supported by pairs of stakes driven into the mud. Some of the largest of these nets in use along the coast of Bombay are 500 to 700 feet in length with a mouth of 200 to 300 feet in circumference. They are usually set against the tide, which sweeps the prawns into them. The nets are pulled up at the turn of the tide.

Several variants of this method of shrimp fishing are used in different parts of India. Sluice gates to a tidal pond, for example, may be left open with the flood tide. As the tide ebbs, a net which catches the shrimp that move out with the tide is placed over the sluice.

Ricefield fishing

In the northwestern districts of Travancore-Cochin, shrimp are taken in ricefields on a commercial scale. The method is similar to that employed in other Indo-Pacific regions and was first adopted in the villages bordering Cochin harbor. Currently, about 10,000 acres are reportedly in use for shrimp cultivation during a part of the year. The ricefields in the Cochin area are cultivated only once a year (June-October) and during the rest of the year are used for shrimp cultivation. Metapenaeus affinis and M. dobsoni constitute the bulk of the catches from the ricefields. The better ricefields may yield around 1,000 pounds of shrimp per acre.

Canal fishing

In the canals intersecting the Vypeen Island in Travancore-Cochin, shrimp are caught by a net fixed at the end of two bamboo fences converging from both banks of the canal. The right to fish for shrimp in these canals is awarded each year to the highest bidder by the Department of Fisheries of the State.

Lake fishing

The lake fisheries, particularly those in Travancore-Cochin, often employ Chinese dip nets. In the Chilka Lake, the Oriya fishermen construct fences of about 50 feet in length with a ring of traps at the inner end. The habit of the shrimp of moving along the shores of the lake at night is exploited in this manner. The fence guides the shrimp into the enclosed area and then into the traps.

In certain brackish-water lakes, fishermen use two canoes connected by short bamboo poles from which a heavy iron chain is extended. As the canoes are poled over the water, the dragging chain moves over the muddy bottom of the lake and stirs the shrimp up. The shrimp jump out of the water and often fall either directly into the canoes or into special woven sidings attached to them.

Marketing, preserving, and packaging

Shrimp intended for local consumption are taken by the fishermen usually to "middlemen." They pay the fishermen a small predetermined rate and market the shrimp in the local market place. In addition, hawkers carry baskets of shrimp from door to door. If the shrimp are to be sent to inland towns a short distance from the fishing grounds, they are usually packed in such materials as newspapers, butter paper, or dried lotus leaves and placed in cardboard containers or bamboo baskets. Shrimp intended for shipment to greater distances (as from the Bombay area to New Delhi) are usually packed between layers of ice, either whole or headed. They are then shipped by rail or air.

Cold-storage and refrigerated-transport facilities are exceedingly limited. Most of the shrimp shipped over greater distances, therefore, are preserved by drying. Shrimp exported to overseas destinations are either dried or frozen.

Freezing

Shrimp up to sizes weighing 30 to 35 to the pound are frozen after heading, in blocks weighing about 5 pounds. If they are going to United States markets, they are, as a rule, cellophane-packed and loaded into wooden boxes for transportation in refrigerated freighters. Quick-freezing plants for fish and shrimp are located at Sasson Dock, Bombay (a Government of India operation), Kozhikode, Mangalore, Cochin, and Trivandrum. In general, such plants have quick-freezing capacities of about 5 tons daily, ice-making capacities of 5 tons daily, and cold-storage capacities of 20 to 100 tons.

Drying, boiling, and smoking

Most of the shrimp used for drying are dried by spreading out in the sun and are marketed either shelled or unshelled. Recently some of the shrimp sold in the dried form have been boiled before drying. The shrimp are boiled in metal containers with just enough water to cover them. After 2 or 3 days' drying, they are placed in burlap bags and threshed with sticks. The pieces of shell are removed, and the dry meat is packed in bags, mostly for export to Burma, Hong Kong, and Singapore. A semi-drying process has been popularized by the Madras Fisheries Department. The shrimp are boiled in 6-percent brine for about 2 minutes, and then removed from the brine and shelled. Next they are placed in a saturated salt solution for about 30 minutes. The shrimp are dried either in the sun or by mechanical driers. In the Collair Lake area some prawns are smoked.

Exports

Statistics on exports of shrimp from India are not available. It is understood that dried shrimp is exported to Asian markets, principally Burma, Hong Kong, and Singapore. Exports of frozen shrimp to the United States have increased in recent years. One firm in Kozhikode is reported to have exported about 90,000 pounds of shrimp (half ocean and half fresh-water shrimp) to the United States over a period of a few months since September 1955, and another at Ernakulan is reported to be exporting about twice this quantity of fresh-water shrimp annually.

As Indian shrimp are reported to be similar in quality and flavor to the shrimp sold in United States markets, there seems to be good prospects for building up this trade with the United States, particularly if efforts are made to exploit the shrimp resources in deeper waters. In 1956 United States imported 1,012,185 pounds of shrimp valued at $419,104, and 1,251,916 pounds valued at $539,896 in 1957.

Governmental regulations

The only regulations pertaining to shrimp fishing in India are those in respect to paddyfield fishing, which is permitted from November to March, and which is regulated primarily in the interest of rice cultivation.

Government assistance

The various State Governments are reported to have provided substantial sums to the fishing industry, but little has been specifically designated to aid shrimp fishing. The Bombay Government is not making any special effort to foster a shrimp industry in that State; it apparently has adopted the view that shrimp in the inshore and offshore waters of the Bombay coast are not sufficiently abundant to justify it. Commercial exploitation of shrimp in the offshore and deep-sea waters is regarded as a project that should be undertaken by private industry.

The neighboring governments of Kutch and Saurashtra, on the other hand, have been actively engaged in collecting statistics on shrimp landings with the object of formulating a shrimp-fishing program. The Saurashtra Government is also experimenting with a new curing method which involves the partial drying of shrimp. While the shrimp dried by the traditional method are said to be of a dirty-white color, under the improved method the product has an attractive orange color, is almost odorless, and has more meat. The Fisheries Department of the government of Kutch is planning to organize fishing cooperatives and to provide technical education to fishermen. In Andhra, no assistance is given to the industry by the State Government, but the Travancore-Cochin Government assists cooperative societies in the production and export of shrimp by granting loans for these purposes. The Madras Government supplies

salt to fishermen at subsidized rates for curing shrimp and also operates freezing plants, some of which have been leased to private companies engaged in shrimp fishing.

The Central Government of India has provided funds for the establishment of ice plants, the mechanization of fishing boats, and the training of Indian fishermen in power-fishing methods. The Government also grants concessions in the application of import duties on machinery and equipment to be used by the fisheries.

Foreign government assistance

The assistance given India by foreign governments in fishery matters is principally in the field of education; it is not particularly confined to the shrimp fishery. The Government of Norway is cooperating in the project for community development in Travancore-Cochin fishing villages through the expansion of fishing activities in that State. Under the terms of the Indo-American Technical Cooperation Agreement, trawlers, other fishing vessels, and fishing equipment have been provided certain Indian States, and specialists are instructing Indian fishermen in new fishing methods and procedures.

Employment of foreign vessels

There is little information available on the number and type of foreign vessels engaged in shrimp fishing in India or on the arrangements under which such vessels operate. A shrimp trawler has been supplied to the Travancore-Cochin government by the United States Technical Cooperation Administration in India, and other equipment has been provided under terms of the Indo-American Technical Cooperation Agreement. It is understood that catches of the vessel originally were earmarked for sale to the Madras Government, but now may be sold to private concerns. It is anticipated that additional trawlers will be made available to other State Governments. In Travancore-Cochin, two Norwegian 30-foot dories and one larger schooner reportedly are engaged in exploratory fishing activities for shrimp and other fish. A number of private companies, it is further reported, are investigating the possibility of using Japanese-built trawlers in catching shrimp off the Indian coast.

Foreign-capital participation

From the limited information available, it would appear that there are four companies representing foreign interests that currently are, or plan to be, engaged in shrimp fishing in India.

The formation of a joint Indo-American Company to operate in the fisheries of the west coast of India was announced early in 1956. This company plans to quick-freeze and pack fish and shellfish largely

for export to the United States. United States and Indian capital participates in almost equal proportions in this venture. In the initial stage of operation, the company is to operate a deep-freezing vessel which will act as a mother ship to collect fish taken by local fishermen along the coast. The vessel has a freezing capacity of 4 tons a day and cold-storage capacity of approximately 70 tons. It is expected that the first shipments to the United States will consist almost entirely of shrimp frozen and packed on the freezer vessel. The American-built vessel will have a complement of 14 men, all of whom will be of Indian nationality, and will have its headquarters at Cochin, in southern India.

The ship will be used during the entire monsoon period to service shrimp fishing in the backwaters of the Cochin area. This area has been selected since refrigerated cargo space aboard ocean vessels is available from Cochin. A new refrigerated warehouse is under construction at Cochin, and a freezing plant is also available at Bombay. After the monsoon period, the vessel will operate from port to port along the west coast. Negotiations began in 1956 to provide cold-storage facilities along the coast at other points.

One firm in Kozhikode has leased two freezing plants from the Government of Madras. Six fishing boats were obtained for the delivery of shrimp along with supplies from local fishermen. The corporation is operated by an Indian national with the assistance of United States capital. Early in 1956 the firm was experiencing some difficulty in obtaining adequate supplies of shrimp. The frozen-shrimp industry is in competition with the dried-shrimp business. The latter is being promoted by the Indian Government, in order to revive its trade in that commodity with Burma.

Future possibilities

The development of India's shrimp fisheries will require improvements in (1) the education of Indian fishermen, (2) the exploration of new fishing waters, and (3) the methods of catching, preserving, and distributing. The Indian shrimp industry undoubtedly needs foreign technical and financial assistance.

Most of the Indian fishermen are illiterate and are often indebted to money lenders and traders. In many instances, religious and social beliefs hamper their development, and they are regarded as belonging to one of the lowest social castes in India. They need education, social recognition, and the opportunity to achieve at least some degree of economic independence.

The bulk of India's shrimp catch consists of young and immature shrimp caught in estuaries and in tidewaters. Production could be increased if greater efforts were made to tap the resources of deeper waters, to develop shrimp fishing in the Kutch area, and to increase the area devoted to shrimp farming. Exploratory trawling could be conducted to a depth of 40 fathoms to determine if exploitable concentrations of shrimp exist. The Kutch area has immediate possibilities and could be fished during the monsoon period.

Vast supplies of shrimp have been reported by an FAO fishery engineer as being available in about a 4-mile-wide strip extending from Beypore north to Mangalore, a distance of about 140 miles. Depths range from 1 to 5 fathoms. These shrimp reportedly average 4 to 5 inches in length and have been caught in substantial quantities in small trawls towed by a 10-horsepower open boat.

It is estimated that there are 2,000 square miles of "culturable" but at present barren water in the form of tidal estuaries, swamps, and backwaters which, if placed under shrimp farming, could augment Indian production of shrimp. As a result of experiments recently conducted by fishery authorities at Narakal, it was determined that at least 800 pounds of shrimp per acre could be harvested annually from such areas.

India is slowly expanding its use of modern shrimp-fishing methods and equipment, but will have to do more along these lines to boost production and exports. There is a need for modern trawlers and gear in the fishery, and new methods of preserving, packaging, and marketing must be adopted to help the industry attain the goals envisaged for it.

The availability of export markets for Indian shrimp should provide a powerful incentive for the expansion of the shrimp fisheries. The recent visit of a Burmese purchasing mission to India, it is reported, resulted in orders for Indian dried shrimp to the extent of 3 million rupees ($600,000). There is also a strong demand in the export market for frozen shrimp, and an Indian firm reports (1956) that it has an offer from a United States importer for well over a million pounds of frozen shrimp per month.

CEYLON

Fishing for prawns (large shrimp) has been carried on in Ceylon's lagoons and estuarine waters and along certain parts of the coast from the earliest times. Data on the quantity of production are not available. The principal method of catching shrimp has not undergone any significant change in recent years.

Methods of capture range from the simplest form of feeling with the hands in the fine mud of the lagoon bed to the use of fences, traps, and stake nets set to trap prawns in their migration up or down channels connecting lagoons with the sea. Flares are used at night to attract prawns; catches are best on moonless nights. Cast nets are perhaps the most widely used gear. They are used both by waders and by men in dugout canoes. Considerable catches of penaeid prawns are made in beach seines, particularly off the northwest coast, where mangrove formation provides extensive growing grounds.

Government trawlers have found prawn beds in 10 to 15 fathoms of water which on trial hauls, have yielded over half a ton of large-sized penaeid shrimp. The net used in these exploratory hauls was not suited to shrimp fishing, and as it came alongside, large numbers of shrimp were seen to escape through the mesh. Additional exploratory hauls have revealed the existence of an area of mud bottom at a depth varying from 9 to 15 fathoms, about 10 miles south of Manapad light on the South Indian Coast. The best fishing results were at a depth of 14 fathoms during a westward tow, which yielded 22 baskets of prawns. Prawns have been found on this ground during the southwest monsoon only. This accords closely with conditions on the west coast of Ceylon where some of the rivers and lagoons in which prawns are found are landlocked until the heavy rains in April or May restore their outlets to the sea. It is possible that a migration of prawns from the west coast of Ceylon commences during the early part of the monsoon. Experimental work with a 12-foot shrimp beam trawl towed from a 28-foot powered fishing boat is being planned. The trawls were obtained from Denmark.

While the study of fishing methods and bionomics is going forward, the culture of prawns in brackish water areas is receiving attention. Efforts are being made to set up demonstration rearing ponds.

Prawns are marketed whole, irrespective of size. The principal market for them is in Colombo. They are used for bait as well as for food. Under current supply and demand, the prospects of establishing an export market for Ceylonese shrimp are not bright.

PAKISTAN

Available data on shrimp landings in Pakistan, believed to be reasonably accurate, indicate that the catch in 1954 totaled about 24 million pounds, a slight decline from the level of the preceding 2 years. Approximate catch data for the years from 1952 to 1954 are shown below (as reported in the FAO Yearbook of Fishery Statistics):

	1952	1953	1954
	(In thousands of pounds)		
West Pakistan	13,154	9,427	5,511
East Pakistan	20,900	21,208	18,260
Total	34,054	30,635	24,046

Shrimp fishing is carried on in both West and East Pakistan on a commercial scale. The main fishing area is in the Indus delta on the Sind coast with fertile shrimp-fishery grounds within 30 miles of Karachi. In East Pakistan, shrimp in small quantities are taken on the entire coast of Mekran and in the Brahmo-Gange delta from Khulna to Dubla Islands.

West Pakistan is on the Arabian Sea with a coastline of about 500 miles. The Sind coast, extending from Sir Creek on the southeast to the Hab River on the west, is about 200 miles long and consists largely of the delta of the River Indus. It is mostly muddy, and the shrimp grounds extend throughout this coast. The main centers for shrimp fishing are Mal, Jhabb, Dabbo, Paitiani, Waddi Khuddi, and Korangi extending to the Karachi harbor.

The Mekran coast extends from the River Hab to the Gwatar Bay and is formed of large bays broken by backwaters. The main fishing centers are Sonmiani, inside Sonmiani Bay, Kalmat on Kalmat Creek, Ormara, Pasni, Gwadar, Ganz, and Jiwani. There appear to be extensive shrimp grounds in these areas from which a fairly large catch is dried and exported.

East Pakistan has a coastline of about 200 miles, consisting of mud flats of the rich area of the Ganges-Brahmaputra deltaic region. Shrimp grounds exist along the delta and near Cox's Bazaar and some of the islands near it. A large quantity of shrimp are found in the brackish and fresh waters of East Pakistan.

Most of the catch is composed of Penaeids (Penaeus and Metapenaeus). The shrimp reportedly average 20 to the pound. The catch is made up about as follows:

Penaeus indicus	50 to 55 percent
Metapenaeus sp.	15 to 20 percent
Penaeus metguiensis	10 to 15 percent
P. semisulcatus	10 to 15 percent
Parapeneopsis sp.	5 percent

Catches of shrimp are recorded in all months of the year, but most are taken from November through March in the Indus delta and from February through April on the Mekran coast. On the east coast of Pakistan the shrimp fishing season extends from October through April. Fishing in the creeks is on a year-round basis.

A fleet of 150 to 200 small sailboats is used in the shrimp fishery. By the end of 1956, modern facilities for the construction and repair of boats will be available in a new shipyard.

More than 80 percent of the catch is made with beach seines; tidal barriers account for 12 to 14 percent; cast nets take 6 to 8 percent.

The potentialities of the Pakistani shrimp fisheries appear very great. At present, fishing for shrimp is limited to the shallow creeks and to limited areas of the coastal beaches to a depth of 3 to 4 fathoms only. Further expansion of the industry depends upon the introduction of modern methods of processing and catching, the organization of marketing and trade both local and foreign, and the provision of mechanized transport.

Most of the catch is processed as dried or smoked shrimp. During 1953, a freezing plant was established at Karachi. This plant began to operate on a commercial scale late in 1955. Another firm opened a freezing plant in November 1957. A small shrimp-canning plant, built in 1954, is now canning up to 500 or 600 pounds of shrimp a day. The pack of this plant is exported to the United Kingdom and Italy. In 1957, the freezing plants exported over 8 million pounds of prawns.

A company financed jointly by United States and Pakistan capital operates the pioneer freezing plant at Karachi mentioned above. Shrimp-fishing grounds within 30 miles of Karachi permit freezing within 12 hours after capture. Efforts are being made to enlist Japanese fishing vessels to fish for this plant.

Early in 1956 a shipment of 20,000 pounds of frozen shrimp was exported from Karachi to the United States from the plant jointly owned by Pakistani and United States interests. Much larger shipments were made during 1957.

A Japanese freezer-trawler mother ship with two 5-ton trawlers operated in waters off Karachi in 1955. Prior to that, this vessel had operated in the Persian Gulf west of Pakistan under contract with the Iranian government.

A vessel has recently been obtained by the Government of Pakistan under foreign aid from the United States to explore the shrimp beds and other fisheries.

The Pakistan Agriculture Development Corporation advanced loans for investment in all types of crop-producing industries; but so far no local entrepreneurs have applied for loans for the development of the shrimp industry. Foreign investors may provide as much as 60 percent of the total investment in Pakistan development projects. No tax is levied on foreign firms operating in Pakistan.

Exports of dried salted shrimp from Pakistan totaled about 1,667,000 pounds in 1952, 1,651,000 pounds in 1953, and 719,000 pounds in 1954. The principal export destinations were Burma, Hong Kong, and Kuwait; Ceylon and India were other markets.

United States imports of shrimp from Pakistan in 1956 amounted to 229,070 pounds valued at $82,372, and 472,000 pounds valued at $198,774 during 1957.

BURMA

Shrimp production in Burma for 1955 and for each of the two preceding years, was estimated to have been in the neighborhood of $24\frac{1}{2}$ million pounds. About $17\frac{1}{2}$ million pounds of this quantity were marine shrimp and the balance fresh-water shrimp, mainly from lower Burma. Of the marine shrimp, it was estimated that 7 million pounds were caught in the delta area of Burma, which includes the area from Pagoda Point at the ocean end of the Bassein River estuary to Moulmein. About $3\frac{1}{2}$ million pounds were taken along the Arakan coastal area, which includes the coast from Pagoda Point up to the Pakistan border, and 7 million pounds were from the Tenasserim coast, which stretches from Moulmein down to Victoria Point.

The marine-shrimp hatch at sea and then enter the fresh-water rice paddies. After they have increased in size, they return to the ocean to spawn. The Burmese fishermen catch them both coming and going. The marine shrimp are caught mainly in stationary nets made of cotton. Fishing is carried on from January to October in the rivers, and from October to March in the estuaries. Fresh-water shrimp are caught in floating traps made of bamboo. The traps are tapered with two guiding barriers or wings constructed of bamboo posts and screens. The wings are up to 225 feet long. This fishery produces almost 11 million pounds in the Irrawaddy Delta area where there are deep rice paddies. The season extends from January to October.

The predominant commercial species taken is Metapenaeus sp. The next in importance is the fresh-water shrimp, Macrobrachium sp., and third is Penaeus sp. The first is estimated to average around 30 to the pound (presumably heads on) and is the smallest of the three species. The second averages about 2 to the pound, many weighing as much as 1 pound each. Penaeus sp. averages about 4 to the pound. No canneries or freezers exist in the industry. The shrimp are mainly dried or smoked. Some larger shrimp are brought to the market iced. Inland water transport boats bring large quantities of fresh iced shrimp to the main markets in lower Burma.

No shrimp are currently exported from Burma. Imports of dried shrimp come principally from India, very small amounts have been received from Pakistan, Japan, and Hong Kong.

The government of Burma has not given any substantial assistance to the development of the shrimp-fishing industry. So far only small loans have been granted to cooperatives in the shrimp fishery for purchase of boats and nets, but it is planned to increase the size of the loans to supply the industry with materials needed for the shrimping.

Two Japanese-owned vessels are employed by a company which is a joint Burmese-Japanese venture. Another vessel to be owned outright by the company was commissioned in Japan. The ship was scheduled to be in operation in Burmese waters about July 1956. Representatives of the firm have indicated that a large expansion of the shrimp fishery and of other branches of the fishing industry of Burma could be brought about with the introduction of refrigeration.

Large untapped resources of shrimp are believed to exist in the long coastal area of Burma as well as in the many estuaries and bays along the coast. Waters of the Burmese coast are reported to be rich in shrimp, but exploitation of the resources requires equipment and manpower.

IRAN

Shrimp are not produced in commercial quantities in Iran. Japanese exploratory surveys have been made recently in the Persian Gulf which reportedly produced 8 tons of shrimp. A substantial quantity of small shrimp was discarded in the course of this operation.

Reports of the formation of a joint Japanese-Iranian company to exploit the fishing potential in Iran have not as yet been substantiated. Plans for joint American-Iranian operations have not progressed beyond the initial negotiation stage.

JAPAN

The Japanese shrimp catch in 1954 totaled about 112 million pounds. The principal shrimp-fishing grounds are in Uchira Bay, Hokkaido; the waters of northeastern Hokkaido; the Inland Sea; Osaka Bay, Ise Bay, and Ariake Bay, Kyushu. The main fishing season is from June through September.

About 90 percent of the catch is taken by small trawlers of 15 to 20 tons' capacity. Most of the shrimp vessels also take other kinds of fish with shrimp averaging about half of the total catch during the shrimp season.

The catch in recent years has been about double the prewar catch. Catch statistics for 1952-54 are as follows (as reported in the FAO Yearbook of Fishery Statistics):

	Thousand pounds
1952	96,760
1953	91,121
1954	112,071

The predominant species in the catch are Penaeus japonicus, averaging about 5 to the pound; P. semisulcatus, also averaging about 5 to the pound; and Metapenaeus joyneri, averaging 40 to the pound. Many other species are also prevalent in Japanese waters.

Japanese shrimp are boiled and dried, for the most part; some are canned. Freezing and canning is done by plants which also handle other marine products. Japanese production of manufactured shrimp products in 1953 and 1954 was reported as follows (in the United States Foreign Service Despatches):

	Boiled and dried	Canned
	Pounds	Cases
1953	8,402,884	587
1954	7,187,591	7,698

Japanese exports of shrimp have ranged as follows in 1953 and 1954 (reported in United States Foreign Service Despatches):

	Canned	Frozen	Dried 1/
	Cases	Pounds	Pounds
1953	780	273,811	1,104,064
1954	94	291,228	1,386,693

1/ Principal destinations for dried and salted shrimp are Formosa, Hong Kong, and the Philippines.

Before World War II, Japan was the principal export market for United States frozen shrimp. In the 1934-38 period, United States exports to that country averaged 1,775,000 pounds annually. Export statistics for recent years are as follows:

	Frozen		Canned	
	Pounds	Value	Pounds	Value
1951	9,300	$6,679	-	-
1952	5,996	4,366	-	-
1953	2,534	2,210	1,425	$1,320
1954	24,280	18,223	-	-
1955	8,000	7,050	2,600	2,548
1956	1,500	1,500	-	-
1957	-	-	2,500	1,600

Current Japanese imports of fresh or frozen shrimp are relatively small when compared with prewar levels. Imports in 1954 from Australia, South Korea, Oman, and the United States totaled approximately 70,000 pounds. The United States government obtained a reduction in the Japanese import duty on fresh, chilled or frozen shrimp or prawns from 10 percent ad valorem to 5 percent in the 1956 Geneva trade agreement negotiations.

In recent years, United States imports of shrimp from Japan have shown a sharp upward trend, as evidenced by the following data:

	Pounds	Value
1951	48,855	$28,301
1952	107,984	75,876
1953	388,802	254,575
1954	438,920	241,237
1955	905,711	455,745
1956	2,587,878	1,580,007
1957	2,865,197	1,855,007

According to reports from the Japanese Fisheries Agency there appear to be no immediate prospects for any substantial expansion of the Japanese shrimp industry.

PHILIPPINES

The production of shrimp and prawns in the Philippines during 1954 was 5.8 million pounds. Shrimp are caught by otter and beam trawls operated by vessels of the sampan type. These have wooden hulls and semi-diesel engines.

The principal fishing grounds are Asia Gulf, Carigara Bay, Guimaras Strait, Malampaya Sound, Manila Bay, Magueda Bay, Rogay Gulf, Samar Sea, San Miguel Bay, Sulu Sea, and Visayan Sea.

The catch of shrimp in recent years has ranged as follows (as noted from United States Foreign Service Despatches):

	Thousand pounds
1952	2,891
1953	3,568
1954	5,823

The increase in the catch of shrimp was apparently due to a gradual increase in the number of trawlers fishing for shrimp. The catch statistics are not too reliable, since it is known that some dried shrimp marketed in the country were included in the data.

The predominant species taken are: Penaeus indicus, P. canaliculatus, Metapenaeus affinis, M. monoceros, and Penaeus monodon.

The shrimp vary in size from 2-2/3 inches to 10-1/2 inches from tip of the rostrum to tip of telson (stretched) and range from 4 to 110 whole shrimp to the pound.

Among the gear used in the shrimp fishery are pocketseine nets, cast nets, push nets, skim nets, stake nets, dip nets, drag nets, (beam trawl and otter trawl) pots, and gill nets.

There are no shrimp canneries in the country and there is only one commercial shrimp freezer in Manila. Exports of shrimp consist exclusively of the small Bagoong Alamang or salted shrimp (mysis larval forms of the family Penaeidae, genus Penaeus, and adult Palaemonidae of the species Palaemon luzonensis) and are destined principally for Guam and Hawaii. Statistics for the years 1952-55 are as follows (based on materials in the United States Foreign Service Despatches):

	Pounds
1952	1,320
1953	6,424
1954	16,667
1955	13,064

No foreign vessels are engaged in the shrimp fishery. Licenses to operate may be issued to citizens of the Philippines or of the United States, and to associations duly registered or incorporated under the laws of either country and authorized to transact business in the Philippines. This requires that at least 61 percent of capital stock or interest belong to either Philippine or United States citizens or to citizens of countries which grant similar rights to citizens of the Philippines.

The principal prospects for expanding production lie in the cultivation of shrimp in fish ponds. The shrimp known scientifically as Penaeus monodon is now being cultivated on a commercial scale. This species commands the highest price among shrimp found in the local markets. They are usually from 8 to 11 inches in length. The abundant supply of shrimp fry found generally in the Philippines makes the development of this fishery a promising enterprise.

SOUTH KOREA

The catch of shrimp in South Korea during 1954 was reported at 32.8 million pounds, of which about 4.1 million pounds were prawns. The 1953 catch was reported to total 46.5 million pounds.

United States imports of shrimp from Korea have ranged as follows in recent years:

	Pounds	Value
1952	10,000	$3,442
1953	3,990	1,556
1954	14,550	6,041
1955	-	-
1956	3,968	1,682
1957	58,219	24,267

INDONESIA

Reliable data on shrimp production in the archipelago are not available. An annual level of production of about 5.3 million pounds is reported. This quantity, it is believed, understates actual production because of the inadequacy of statistical data collection techniques and lack of information from some important fishing areas.

The bulk of the shrimp are small in size, less than 1 inch in length, and are used primarily in the preparation of fermented pastes. The shrimp fisheries are scattered extensively. Considerable quantities of shrimp are taken in brackish-water ponds. Small shrimp are taken with a scoop net pushed by hand in shallow water, by weirs and traps, and by a type of fyke net operated in river mouths and elsewhere in strong current.

The predominant species are of the penaeid variety. They range in size from 1/2 inch to 14 inches or more.

The potentialities for expanding the shrimp fishery are great, since extensive areas of the marshland adjacent to the coasts of Sumatra, Java, and Kalimantan have extensive trawlable flats offshore. The areas are known to support shrimp populations which are at present virtually unexploited.

An exploratory shrimp-trawling operation has been in preparation under aid provided by the United States Technical Cooperation Administration designed to develop the fishery in the area. The shrimp-trawling venture has met with some delay pending the clearance through customs of the equipment required to complete the rigging of the vessels assigned to the program. The first of two model vessels has been completed, and the second is under construction. There is great interest in this venture in Indonesia.

SINGAPORE

Shrimp are cultivated in rearing ponds. About 1,200 acres are currently under cultivation. The production averages over 1,100 pounds per acre per year or a total of over 1.3 million pounds. By utilization of suitable swampy area not presently used, up to ten times this total could be produced.

Shrimp ponds are constructed by enclosing swampy areas of tidal river basins with a mud dyke fitted with sluice gates. These gates control the flow of water into or from the ponds. The ponds are filled by the tidal flow and the gates closed until the tide recedes. After a sufficient head of water is obtained, the gates are opened and the water in the pond is allowed to run out through long conical nets fitted to the gates. The shrimp and fish carried by the current are thus filtered out by the net.

As the tide rises again above the internal level of the pond, the sluice gates are opened to permit the free influx of the tidal flow which carries with it shrimp and fish. At full tide, the gate is closed. The net is again placed in position and the sluice gate opened.

Most operators work the pond 20 days a month during the period of good tides. The catch generally increases with the spring tides and falls sharply with the highest flood.

The best sites are on low-lying flat tidal swamps in muddy river basins where the physical contours of the area do not permit an excessive fall in salinity even after heavy rains. A raised area limits the total inflow and, hence, the productivity.

The shrimp move in the surface waters only at night. It is desirable to let as much water out as possible during the day to permit a good sweep of the current into the pond at night.

VIETNAM

Official data on shrimp production are not available. The Vietnam Fisheries Service has estimated that annual shrimp production totals about 2.2 million pounds. All shrimp fishing in Vietnam is done by native villagers along the coast of South Vietnam from Phan Thiet southeastward to the Camau Peninsula. Shrimp are also caught in the Gulf of Tonkin, but this area came under control of the Communist Viet Minh in May 1955.

Using handmade gear, fishing boats catch shrimp along with other fish during the season.

Palaemonidae shrimp run 23 whole shrimp to the pound and Penaeidae 12 to the pound.

The Vietnam Fishery Service reports that it is trying to encourage the development of an industry by exhorting local businessman and fishermen to form companies. Owing to lack of credit and inability to visualize the benefits, results have not been too successful.

The only commercial fishing operation is under the direction of a local firm which has been operating two Japanese deep-sea trawlers under contract. These ships are used to catch a variety of fish, including shrimp. They are manned by Japanese who are said to be training the local commercial fishermen. These trawlers were obtained through the International Cooperation Administration.

Only Vietnamese citizens can apply for commercial-fishing permits, but they may hold a contract with foreign shipowners. "Mixed companies" must have controlling interest by Vietnamese citizens. Exports of shellfish are taxed.

Shrimp are usually sold fresh or dried; dried shrimp are exported. About 50 percent of the total catch goes into products for export; the balance is consumed locally. No shrimp canneries or freezers are in operation.

Exports of dried shrimp from Vietnam in recent years, principally to Hong Kong and Malaya, have ranged as follows (as reported in the United States Foreign Service Despatches):

	Pounds
1952	1,442,700
1953	1,253,300
1954	729,100

The potentialities for expansion of the shrimp fishery appear good. The waters off Vietnam up to the 100-fathom line are rich in all varieties of tropical fish. The shrimp caught in these waters are considered good eating by most Americans and compare favorably with United States Gulf coast shrimp. Establishment of a central fish market and cooperatives such as exist in Hong Kong would permit a greater expansion of the Vietnam shrimp market, domestically and for export.

THAILAND

Reliable data on the catch of shrimp are not available. It is estimated that the total catch of shrimp in this country is at least 35 million pounds annually with production definitely on the increase.

The Thai shrimp fishery at present is confined to shores and estuaries of the Gulf of Siam and to lagoons bordering the Gulf. A Japanese-type bull trawl reportedly has recently initiated offshore operations in the Gulf and taken shrimp in addition to other fish and shellfish.

Shrimp fishing is scattered extensively along the coast, principally in the areas off the mouth of the Menam Chao Phya, and at Songkhla within the Inland Sea (Thale Luang) and its outlet to the Gulf.

The Chao Phya fishery is conducted during the dry season, February to June or July, by about 100 small boats including sampans and other craft powered by semi-diesel or diesel engines. Each of the boats uses one or two locally made beam trawls.

The Songkhla fishing is carried on throughout the year by cast nets, beach seines and traps.

The commercial catch of shrimp is made up of many species. At least 50 species have been identified and probably many more remain to be discovered. For shrimp paste, a very small shrimp (Acetes spp.), almost planktonic in size, is used. The largest shrimp, a penaeid type, runs 4 or 5 to the pound, heads on. Between these extremes are other species of varying sizes.

There is no shrimp canning in the country. Shrimp drying and shrimp-paste manufacture are widespread. Although freezer space is available, no shrimp are frozen and no commerce is carried on in this product. Shrimp-flavored chips are manufactured in considerable quantity for local use.

Official data on exports of shrimp are not available. Fresh or iced shipments in small quantities are made occasionally to Malaya from areas bordering that country. Exports of dried shrimp, estimated at about 1 million pounds annually, are made to neighboring countries and to Hong Kong. Small quantities of shrimp paste reportedly are shipped to neighboring countries.

On the basis of field information on the status of explorations and experimental fishing, as well as of commercial operations, the possibilities of expanding shrimp production and processing seem to be fair. Ecologically, the Gulf of Siam is favorable to shrimping operations.

TAIWAN (FORMOSA)

Shrimp and prawn production in Taiwan over the 4-year period 1952-55 was as follows (as reported in the Foreign Service Despatches):

	Thousand pounds
1952	4,470
1953	5,450
1954	4,380
1955	7,080

Catches from deep-sea and inshore fisheries using motor vessels of 10- to 100-tons accounted for nearly half of the total 1955 catch and consisted primarily of shrimp of about 2½ inches in length. Another part of the catch was made in coastal fishing operations by sail- or man-powered sampans. The shrimp taken during these operations averaged less than 2½ inches in length. Cultured prawn averaging 5 inches in length made up the remainder of the catch.

Among the species of cultured prawn, Penaeus japonicus and others of the same genus predominate. All shrimp belong to the Macrura family.

The most common gear in the shrimp fishery are set nets, gill nets, beach seines, seines, and swing bell nets. The peak of the shrimp season is from March through May, although operations are conducted throughout the year. About two-thirds of the catch is taken in the tropical waters off the southwest coast of the island.

Outside of some sun drying by fishermen there is no processing of shrimp, nor do facilities for processing exist on the island.

Production of shrimp on Taiwan is insufficient to meet the local demand. The deficiency is made up by imports of dried shrimp from Japan. There is no export trade in shrimp, nor is there any likelihood that an export trade will develop in the foreseeable future.

AUSTRALIA AND OCEANIA

While crustacea, including shrimp, are available over a wide area of Oceania, there has been little commercial exploitation. In fact, the apparent difficulties and disadvantages in establishing commercial operations has discouraged exploratory fishing to determine more precisely the shrimp resources of this region. Even in New Zealand, where crayfish production has been over 12 million pounds in recent years, the shrimp catch is insignificant. However, Australia has a shrimp fishery of considerable importance, which appears to be destined for further expansion.

AUSTRALIA

The Australian shrimp production has shown an upward trend in recent years, particularly since the start of ocean trawling a few years ago. In the year ended June 30, 1956, the industry produced about 6 million pounds, as compared with about 6.6 million pounds in the previous year. The drop in the 1956 catch was due to heavy rains in the main shrimping season (December through March). The estuary shrimp were washed out to sea and lost during this period.

Catch statistics for the years since 1948 are as follows (as reported in the United States Foreign Service Despatches):

Year 1/	Thousand pounds	Year 1/	Thousand pounds
1948	1,682	1952	2,204
1949	2,623	1953	3,348
1950	3,111	1954	4,257
1951	4,624	1955	6,648
		1956	5,962

1/ Year ended June 30.

In Australian waters, a considerable number of commercially important penaeid prawns are abundant in the estuarine area and in the littoral areas down to the edge of the continental shelf. The shrimp-fishing activities until the mid-forties had been confined to the estuarine area. Following the incidental discovery of schools of large shrimp in ocean waters off New South Wales in 1947, a steadily increasing number of offshore trawlers began to operate these new grounds. With the development of offshore prawn fisheries, particularly in Stockton Bight near Newcastle, N.S.W., and on grounds in the Ballina-Evans Head area on the far north coast, special prawn investigations were initiated in 1951. Since May 1953, comprehensive and detailed studies have been carried out in the fields of biology, ecology, and embryology. The State Fisheries of Western Australia are also exploring previously unknown offshore grounds along the whole western coastline of Australia and are studying the prawn stocks in the vicinity of Moreton Bay, Queensland.

Historical records on the start of the commercial fishery for shrimp in Australia are not available. Migrants from Mediterranean countries were the first to explore the estuaries around Sydney. A commercial fishery seems to have existed in the last two decades of the nineteenth century.

Since 1947 many new grounds have been found and total production of the offshore fisheries in New South Wales surpasses the production from estuarine waters to a considerable extent. Shrimp are taken along the whole coastline of New South Wales. The abundance of large penaeid prawns in Queensland waters soon led to the expansion of the offshore prawn fisheries there. New and well-stocked grounds were discovered off Sandy Cape near Bundaberg, where large tropical species were found in abundance. Investigation of the area inside the Great Barrier Reef indicated the presence of suitable grounds. Latest word is that trawling will soon expand to these waters. Shrimp-trawling operations in offshore waters of Western and South Australia is still in the experimental stage, although penaeid prawns are captured in estuarine waters of these States as well as occasionally in Victoria.

Shrimp species

The following breakdown of the 1955 catch indicates predominant commercial species, size, and catching area (as reported by the Australian Department of Fisheries):

Common name of shrimp	Principal species	Size range	Queensland	New South Wales	Other	Total
		Number of headless per pound	(In thousands of pounds)			
School	Metapenaeus macleayi	20-30	50	2,992	-	3,042
King	Penaeus plebejus	15-20	100	1,151	-	1,251
Greasy-back	M. mastersi M. incisipes	30-40	650	568	-	1,018
Tiger	P. esculentus P. carinatus	15-20	300	92	-	392
Banana	P. merguiensis	20	900	-	-	900
Unclassified		-	-	-	45	45
Total		-	2,000	4,603	45	6,648

The most important commercial species (in order of their importance in New South Wales are Metapenaeus macleayi, Penaeus plebejus, Metapenaeus mastersi, Metapenaeus incisipes, Penaeus esculentus, and Penaeus carinatus.

The major species of Queensland's estuarine production are Metapenaeus mastersi, Metapenaeus incisipes, Penaeus plebejus, Penaeus esculentus, and Penaeus merguiensis. In ocean waters of this State the production of Penaeus merguiensis occupies the leading place, with that of Penaeus plebejus, Penaeus esculentus, Penaeus carinatus, and Metapenaeus endeavouri following.

Along Western Australia, Penaeus merguiensis and Penaeus latisulcatus may become species of economic importance.

The Australian distribution of Penaeus latisulcatus apparently ranges to South Australia, where this species seems to be the only one of commercial value.

The comparatively cold waters along Victoria appear to be inhabited by only a few east-coast species of economic importance. Among them, Metapenaeus macleayi and Penaeus plebejus occur with certainty in quantities of commercial significance south of the New South Wales border.

The small size of some of the species (Pendcopsis novae-guineae, Trachypeneus curvirostris, and T. anchoralis) renders them commercially unimportant, although they may appear during the season in large schools.

The annual catch of shrimp in the estuaries and in the sea appears to be related to the rainfall. The greater the rainfall in the previous 2 years, the greater the shrimp catch in a given year seems to be.

The mass migrations of prawns of all age groups from the estuaries to the ocean during extensive floods is caused chiefly by the rapid fall in salinity of inside waters. With the return of normal salinities in inside areas, prawns reenter the estuaries during the ingoing tide, in all but the adult stages. Penaeid prawns usually enter the commercial catch in estuarine waters during the latter half of November and are abundant until at least the first half of March. Offshore commercial species usually begin to appear in schools around the first half of January and are taken in quantities until the end of June. In wet years, shrimp may be taken almost throughout the year. In dry years, shrimp become scarce.

Fishing gear and operations

Offshore prawn trawlers are operating at present only in a part of the inner littoral area. This area extends from the surf or

river entrances to a variable distance (2 to 5 miles from shore). Bottoms are mostly a mixture of mud and sand, with an occasional growth of kelp; depths range from 1 to 25 fathoms.

In the estuaries, shrimp are taken chiefly with pocketed scoop nets, hauling seine nets, set pocket nets, cast nets, and modified otter-trawl nets. In ocean waters, otter trawls measuring up to 20 fathoms from wingtip to wingtip are used exclusively.

Haul seines are of varying lengths and range from 30 to 450 feet in length. They are worked both from shore and by boats. Pocketed scoop nets are employed only in localities with considerable current during the outgoing tide. They are used across channels or inlets during the outgoing tide at dark of night. The outrunning schools are guided by the wings into the pockets, or bag, which are lifted and emptied from time to time.

In the estuaries, the length of boats ranges from 12 to 30 feet. The size of the offshore trawlers varies from 18 to 75 feet. The inshore boats are equipped with gasoline engines and the majority of the larger boats, particularly the trawlers, are operated by diesel engines of from 35 to 140 horsepower. A few of the larger boats are equipped with electrical refrigerators and cooking facilities to handle the catch during peak production. Most of the trawlers and other boats employ crushed ice to preserve their catch, and cook their catch ashore.

After emptying the cod end on the deck of offshore trawlers, the prawns are culled and the marketable catch is placed in cane baskets for washing. The shrimp are then placed in wooden boxes between layers of crushed ice and transferred to the hold. Cooking is usually done ashore. A few large trawlers cook their catch on board during seasons of peak production in order to make sure that it reaches the market in good condition. Large tanks, heated with diesel oil, handle from 50 to 150 pounds of shrimp. These tanks are equipped with wide rims of wire netting to prevent the spilling of the catch in rough water. After the catch is cooked for 10 to 15 minutes, the shrimp are removed from the tank and transferred to baskets or trays and cooled, for packing in boxes between layers of ice. Trawlers usually stay offshore for 12 to 15 hours.

There are restrictions on the size of gear and the mesh of nets that may be used. These differ by area so that nets of different specifications are used in various localities. A "blubber" trap to keep jellyfish from the bag of the net is necessary in otter trawls.

Trade

The bulk of the Australian catch is sold locally, cooked with heads on. Export data are not available. It is known, however, that small quantities of shrimp are sent to New Zealand, various Pacific Islands as well as the United Kingdom and the United States.

Many efforts have been made to market Australian prawns in the United States -- so far with little success. The principal difficulty has been that prices on the Australian market have generally been as good as in the United States except in periods of infrequent glut. In 1956, 168,730 pounds of shrimp valued at $105,396 were imported by the United States.

There has been a general lack of knowledge as to the best methods of preparing and packaging the product for the United States market, although this situation is rapidly improving. If production should increase so that Australian prices would drop materially, producers would seek foreign markets more actively.

Potential production

Available evidence based on a recent survey suggests that the seas off New South Wales and Queensland may support catches up to five times the present output.

Additional facilities are required to exploit further the shrimp fishery. Additions to the fishing fleet and installation of packing and refrigeration facilities are among the prerequisites for an expansion of the industry. Some grading and peeling machinery has been recently introduced into Australia. There are no shrimp canneries in the country. On the other hand, a number of fishermen's cooperatives have facilities for freezing shrimp. The Queensland Fish Board also maintains freezing facilities.

The Australian fishing industry is composed principally of a large number of owner-producer fishermen. In New South Wales and South Australia many of the fishermen are members of cooperative societies. In Queensland, the Fish Board, a governmental agency, has virtual monopoly over the marketing of fish and shrimp. In other states, marketing is in private hands. Distribution of fresh fishery products is hampered by inadequate refrigerating and transport facilities.

Fishery officials believe that trawling in the Great Australian Bight offers opportunity for qualified foreign investors.

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